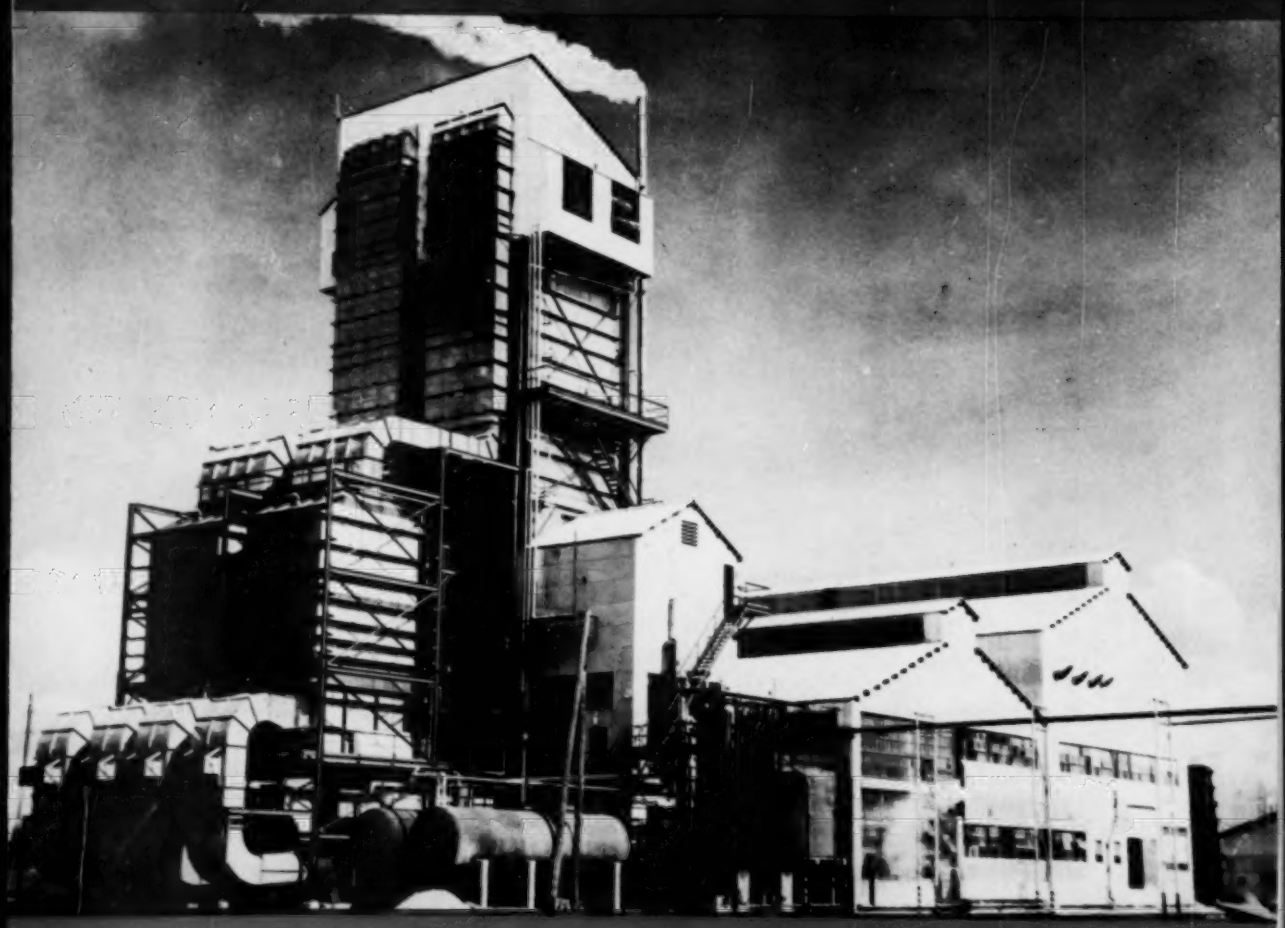
VOLUME V, No. 2 FEBRUARY, 1950

AGRICULTURAL CHEMICALS



In This Issue:

Non-Farm Use of Fertilizers Reported • Illinois Custom Sprayers Meet • Role of Fungicides in Forecasting Service • FTC Fertilizer Industry Report • N. E. Weed Conference in New York • FDA Hearings Under Way in Washington • Water Hyacinth Control • 1950 Insecticide Outlook

2,4-D AND INPC WEED KILLERS
DDT POWDERS AND LIQUIDS
BOTANICALS • ROTENONE • SABADILLA
PYRETHRUM POWDERS AND EXTRACTS
STIMTOX A
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FEBRUARY 1950
VOL. V No. 2

In This Issue:

AGRICULTURAL CHEMICALS

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Editor

THOMAS MORGAN
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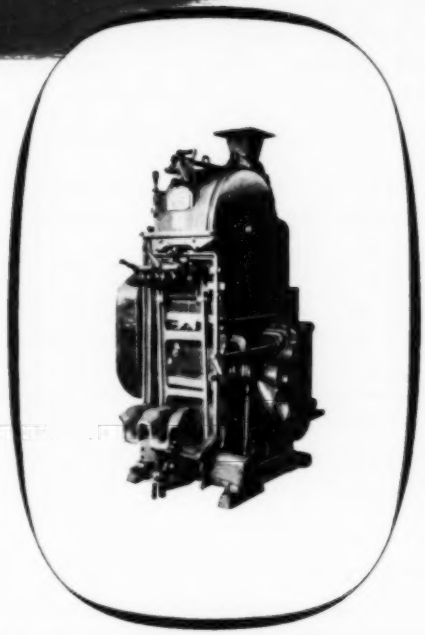

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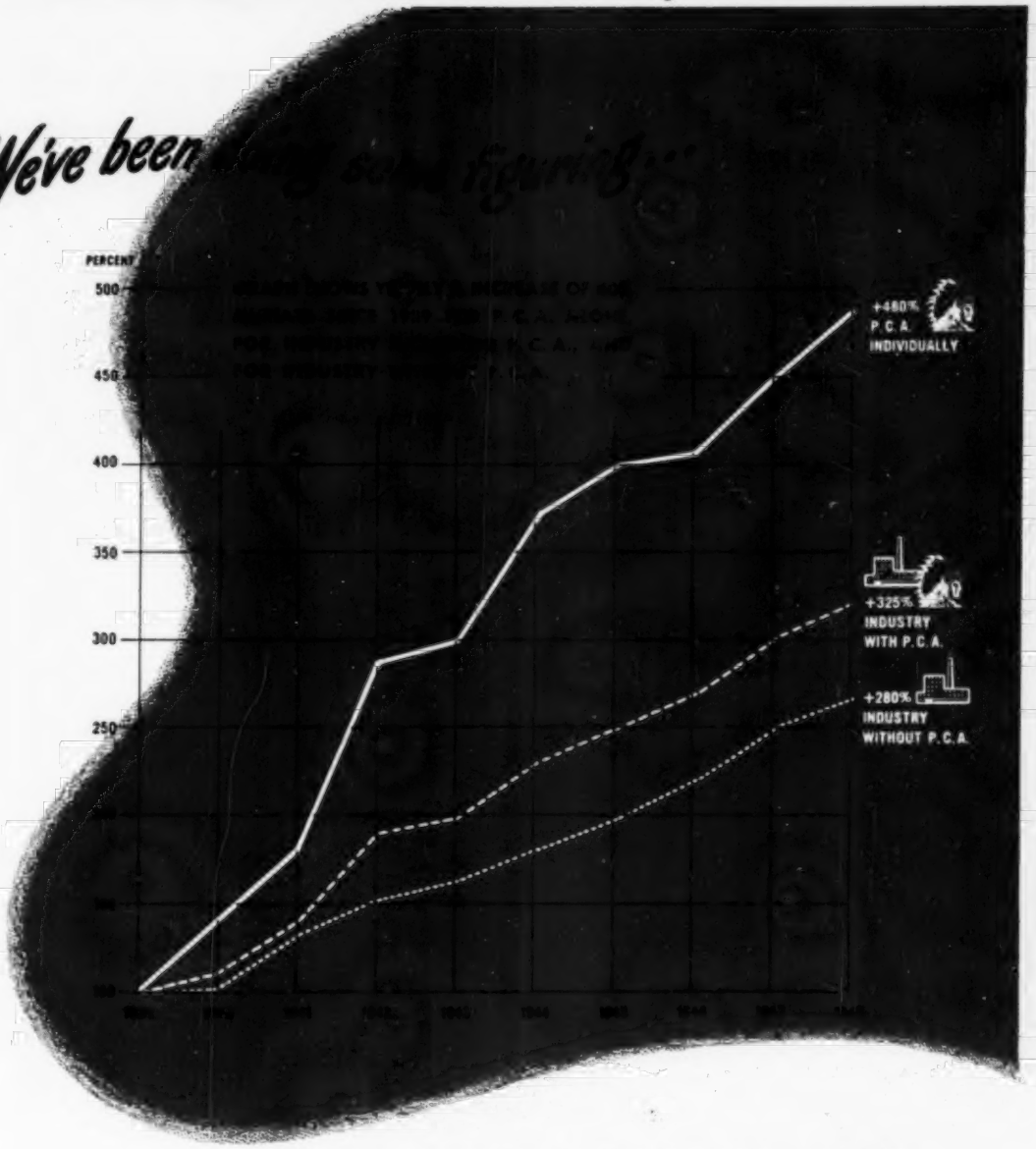

1948 was a record year for domestic Potash. Using '39 as a base, the industry—not including P.C.A.—showed an increase of 280% in 60% Muriate. P.C.A. production lifts the industry increase to 325%. ***P.C.A. alone shows a High Grade Muriate increase for the same period of 480%.***

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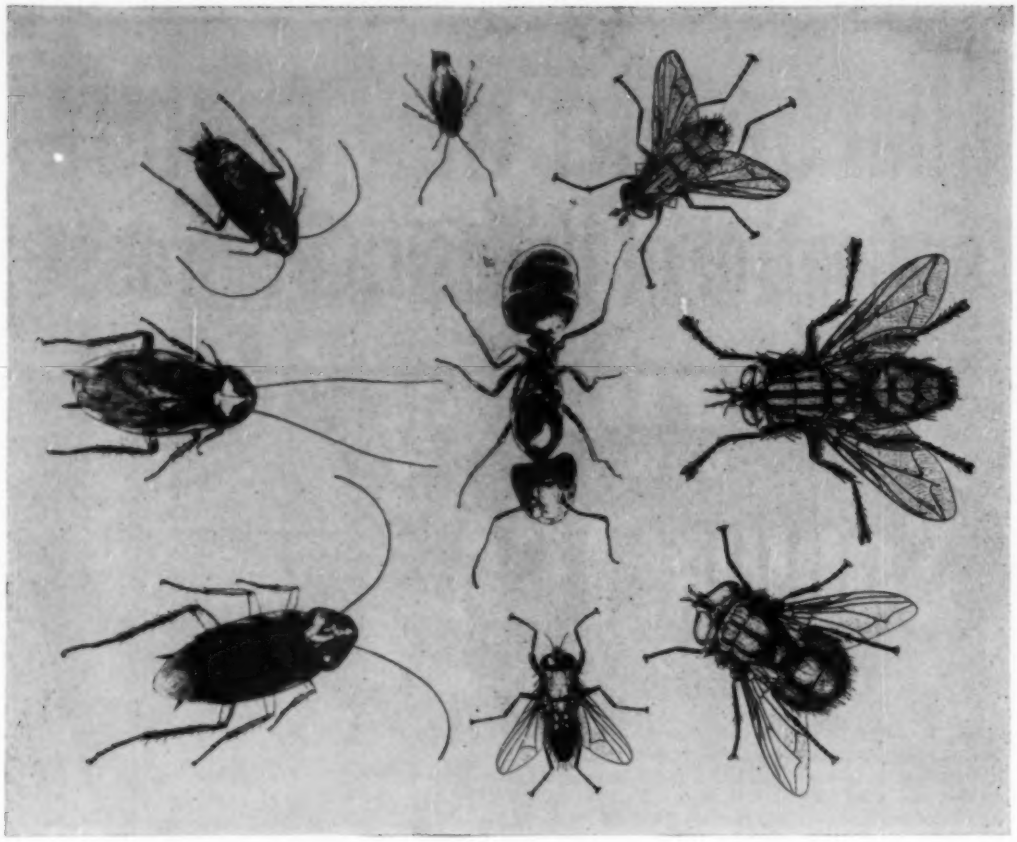

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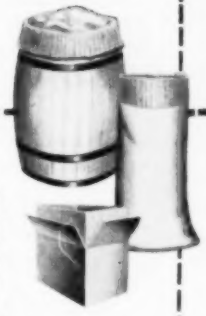

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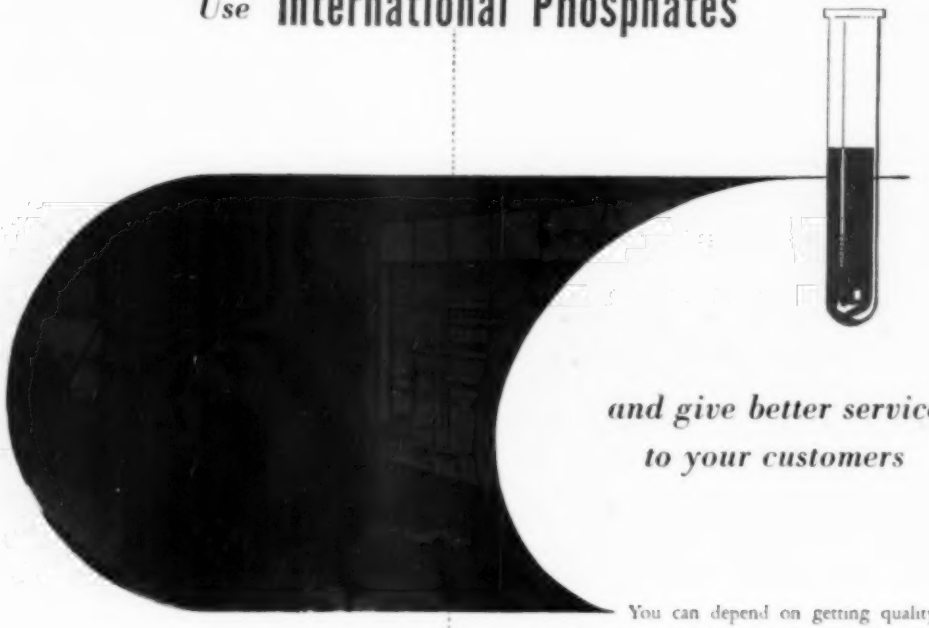

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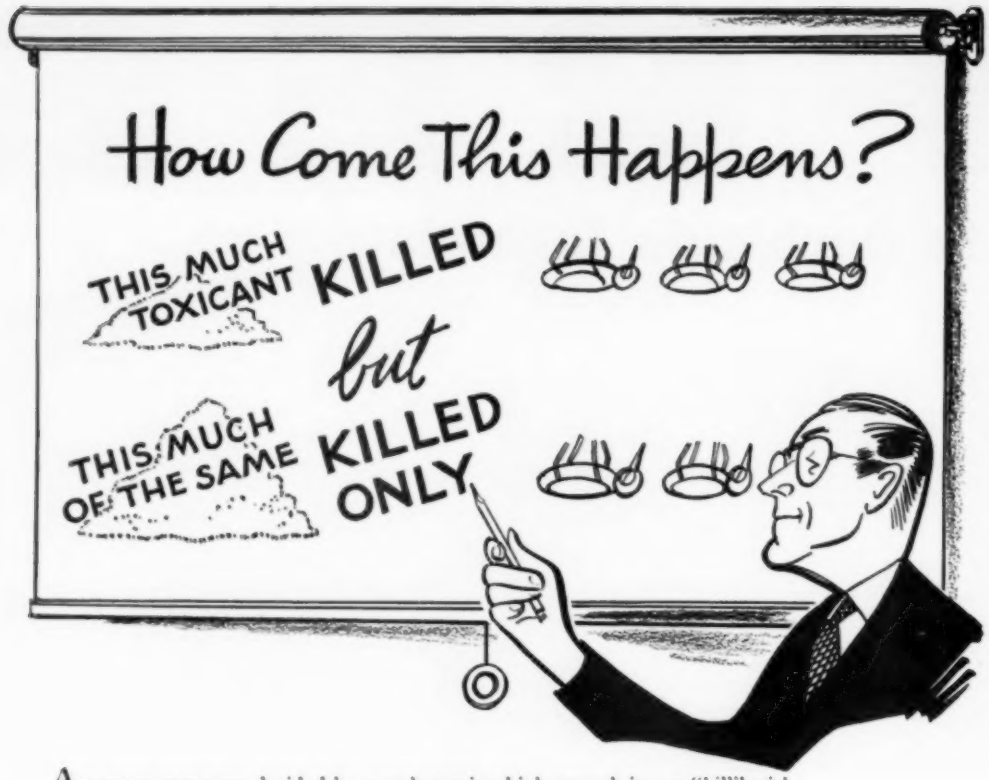

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THE EDITOR COMMENTS

HISTORY is repeating itself! Bad history of 1949 when mixers, processors, dealers in agricultural chemicals waited until it was too late to order out their raw materials from suppliers,—it's with us again this year. Suppliers of insecticide, weed control, fertilizer and allied materials say that buyers are still waiting, waiting, waiting "to see what happens." We can tell them in a few blunt words. They will be caught "waiting" just as they were last year, waiting while growers beat on their doors a month or two hence for prompt delivery of materials which they cannot supply if they fail to do some ordering themselves mighty soon. Some insecticide materials are going to turn up suddenly scarce a few months from now. The recent potash strike has added a further complication in the direction of fertilizers. Numerous requests for immediate shipment will find the same old bottle-neck plugged up again. Was anything learned from 1949 spot scarcities? Maybe, but to us 1950 so far looks like a return engagement of the same act.

ADVOCATES of further socialization of the American government, and further extension of the welfare state idea, in which a benevolent central government passes out favors to some of its citizens,—at least to those whose votes count—receive added encouragement in a report of the Federal Trade Commission on the fertilizer industry, soon to be issued. Although the FTC report does not recommend any specific legislative action, there is the constant threat throughout the document that the government may use the alleged failings of the commercial fertilizer industry to justify further government entry into the fertilizer business on a large scale.

This means, we presume, a greatly expanded and nation-wide TVA, with widened opportunity to distribute free fertilizer supplies to deserving farmers under the guise of "research." It could mean a further extension of the idea that it is the function of government to compete with particular groups of its citizens because of fancied shortcomings in the way they operate their businesses. It could mean that eventually the government will make our shoes and our clothes as well. In our thoughts, it would be just as logical for the government to enter the shoe business on the premise that shoe manufacturers have fumbled the ball by not producing a pair of shoes that will wear ten years.

The idea that the government can produce anything more efficiently or economically than private business of course seems ridiculous in the light of long experience. Traditional government inefficiency, political interference, the absence of the profit incentive, inevitably make government production of any commodity expensive. Honestly computed, *sans* phony bookkeeping and the convenient "research" tag to cover up losses, we venture to predict that government-made fertilizer would prove more costly than the product of the most "archaic" commercial plant. In a freely competitive market, without a government to make up its losses, no TVA fertilizer plant could long survive.

Regardless of the weak foundation upon which the FTC charges stand, they must be faced frankly by the fertilizer industry—and answered promptly. There are those who may believe them because they so choose, or because they know no better. So, let's have a look at the charges. Sharply criticized are "Monopoly controls and distribution barriers" which the FTC alleges keep fertilizer prices too high for the farmer's pocketbook. The commission claims that substantial savings could be effected if the industry would offer mixed fertilizers containing a lower percentage of inerts, if it would locate its plants closer to consuming areas, if it would make essential fertilizer ingredients more freely available to those who might wish to "mix their own."

While there is no doubt that a further growth in the use of high-analysis fertilizers may offer

economies in shipping costs, we question that fertilizer consumers are ready yet for such a complete switch over. Before the FTC starts uprooting an American industry that has played an increasingly important part in the nation's development for over a hundred years, we urge fair consideration to *all* the facts.

In truth, if the FTC really is interested in finding out, no one is more anxious than the fertilizer industry itself to see a wider sale and use of higher analysis products, but many manufacturers have told us that the average farmer simply will not pay more per ton or per bag for a better product. They are prone to look upon such ideas as high-pressure salesmanship. And even if they were sold on high analysis products, would present application equipment, in which a tremendous investment is tied up, be adapted to give the more accurate coverage necessary? Overdosing with high-analysis fertilizer could be really expensive!

Then too, there is the problem of the small fertilizer plant, which has stood the test of time and competition, serving its community's needs for plant food. Many of these mixing plants are not set up today for the production of high-analysis fertilizers. Should these businesses be wiped out summarily by government edict, or subjected to further unfair competition with "give away" government fertilizer? Are they "kulaks" to be liquidated?

To the charge that fertilizer plants should be built closer to the consumer, the obvious answer is that private industry is relocating them as rapidly as is economically possible. Note the new factories springing up in the midwest. Just how the distant potash mines might be relocated, closer to the Carolinas, however, is a problem which we fancy even the FTC could not solve.

This discussion could go on and on. The ultimate solution, we are convinced, lies in long range education, not in government intervention and the use of a meat-ax on the fertilizer industry. We still stick to the premise outlined here on previous occasions, that the private fertilizer industry, if allowed to operate without undue governmental interference, can and will do a better job for American agriculture than can any Federal agency with its grandiose and expensive schemes. America's farms are fast being populated by younger and better trained farmers who will know where and how to use higher-test fertilizers economically. This new generation will demand, and offer a market for, the improved plant food products that the fertilizer industry has been trying for years to sell to their fathers.

THAT modern custom spraying and dusting is serious business with the great bulk of those taking part in it, was emphasized at the recent meeting of the Illinois operators held at the University of Illinois. Those in attendance, no doubt representative of the profession the country over, not only listened attentively to machinery and chemical experts on the program, but also had somewhat to say for themselves at the conference.

Joseph Wright, a pilot since 1925, summed up the situation nicely in a symposium with other custom operators who were roundly condemning irresponsible "barnstormers" who build up a bad reputation for the business. "The public must be convinced that we are not a bunch of 'hot rods'," he declared. "There is no fancy stuff with crop treating any more. . . it is a hard-boiled business now, and there is no need for glamor."

The serious attitude taken by attendants at this school and others around the country speaks well for the future of custom operations. With increasingly complicated problems in connection with agricultural pest control, schools for operators are going to be more and more imperative. The careless and irresponsible operator who is after the quick and easy money is bound to fall by the wayside in the process, but so long as his type remains, the whole profession is in jeopardy.

As Mr. Wright says, there is no place for "hot rods" in the serious business of protecting agricultural crops. Too much is involved to allow any operation other than by those persons with full knowledge of what they are doing, the hazards involved, and the high cost of error.

Insecticide Use Seen Essential to American Agriculture

By

Dr. F. C. Bishopp

at the opening session, January 17, 1950, of the Insecticide Tolerance Hearings being conducted by the U. S. Food and Drug Administration, Washington, D. C.

FRUITS and vegetables would be unmarketable without the use of insecticides, whether the standard is set by consumers, market graders, or inspectors of the Food and Drug Administration. Dr. F. C. Bishopp, Assistant Chief of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, asserted in his testimony delivered January 17th in Washington D. C., before the Hearings being held by the Federal Security Agency's Food and Drug Administration to determine the amount of poisonous or deleterious substances which may be safely permitted on fresh fruits and vegetables. "The saving of life, the prevention of sickness, and the increase in food production that can be directly credited to the use of insecticides during and since World War II, are tremendous," Dr. Bishopp stated.

"On the other hand," he said, "there is no substantial evidence that any adverse effect on public health has resulted, in spite of the fact that nearly one billion pounds of insecticides are used annually in this country."

The purpose of the Hearings is to take evidence on the necessity for using added substances, such as insecticides and fungicides, for controlling the enemies which interfere with the commercial production of fresh fruits and fresh vegetables. The term "commercial production" of these crops is interpreted to mean production up to the time of harvest.

"Wormy apples, berries, cabbage, maggot - infested peppers. wormy corn, celery, and other crops, would reach the market fit only for garbage disposal unless the insect pests are controlled. Standards set on insect contamination by market inspectors and Food and Drug officials are a guarantee that such foods will reach the consumer in reasonably good condition," Dr. Bishopp said.

"This would not be possible without use of insecticides. Many products now enjoyed by the American public would no longer be found in our markets. The fruits and vegetables of high quality now reaching the consumer are not accidental. They are available by virtue of carefully planned and executed control through the use of insecticides and fungicides.

"If restrictions are placed against the use of some of these materials,

(*Turn to Page 87*)

U.S.D.A. Reports 1947-'48 Non-Farm Consumption of

FERTILIZERS [1]

TABLE 1 **Consumption of Commercial Fertilizer Mixtures and Separate Materials for Non-Farm use During the year ended June 30, 1948.**

States & Regions	Number of Grades		Non-Farm Consumption			Percentage of All Fertilizers for Non-Farm Use	
	Non-Farm Uses	Total All Uses	Mixtures	Materials	Total	Mixtures	Materials
			Tons	Tons	Tons	Percent	Percent
Maine	18	43	584	1,244	1,828	0.24	7.85
New Hampshire	15	29	326	370	696	2.64	1.81
Vermont	14	28	755	145	900	3.79	0.35
Massachusetts	33	56	3,308	4,837	8,145	5.03	24.10
Rhode Island	16	24	1,298	849	2,147	8.55	21.80
Connecticut	24	44	2,422	2,600	5,022	4.45	8.99
New England	39	65	8,693	10,045	18,738	2.13	7.94
New York	40	67	8,376	6,580	14,956	2.08	3.74
New Jersey	30	58	4,419	3,226	7,645	1.93	12.84
Pennsylvania	21	61	3,266	6,473	9,739	0.68	7.40
Delaware	11	39	1,267	164	1,431	2.47	6.06
District of Columbia	12	16	291	369	660	22.21	80.67
Maryland	17	39	4,508	1,059	5,567	2.03	4.64
West Virginia	11	20	603	239	842	1.10	0.63
Middle Atlantic	55	110	22,730	18,110	40,840	1.58	5.05
Virginia	17	43	2,661	769	3,430	0.49	0.61
North Carolina	7	33	759	2,509	3,268	0.06	0.92
South Carolina	4	33	963	220	1,183	0.14	0.10
Georgia	16	70	2,921	3,346	6,267	0.30	1.15
Florida	25	437	6,597	5,229	11,826	1.01	7.44
South Atlantic	42	478	13,901	12,073	25,974	0.33	1.20
Ohio	18	54	4,341	10,780	15,121	0.54	20.40
Indiana	24	45	6,212	1,889	8,101	0.88	1.88
Illinois	21	39	5,720	9,808	15,528	1.68	1.47
Michigan	13	31	1,329	11,537	12,866	0.38	18.64
Wisconsin	20	47	3,852	3,716	7,568	1.03	7.32
East North Central	33	85	21,454	37,730	59,184	0.84	4.05
Minnesota	23	52	6,478	2,518	8,996	4.73	2.83
Iowa	17	46	1,323	1,221	2,544	0.68	1.07
Missouri	30	35	8,772	2,677	11,449	3.63	2.80
North Dakota	5	27	450	0	450	2.14	0
South Dakota	7	15	118	31	149	1.89	0.68
Nebraska	10	14	1,098	923	2,021	29.87	4.30
Kansas	13	20	2,028	713	2,741	4.67	1.30
West North Central	43	78	20,267	8,083	28,350	3.12	2.13
Kentucky	15	32	3,625	521	4,146	1.11	0.35
Tennessee	11	21	1,843	1,511	3,354	0.54	0.97
Alabama	11	31	1,482	665	2,147	0.19	0.21
Mississippi	9	10	629	2,898	3,527	0.19	0.77
East South Central	24	64	7,579	5,595	13,174	0.43	0.56
Arkansas	6	20	1,206	18	1,224	0.97	0.02
Louisiana	13	25	1,107	1,020	2,127	0.70	0.98
Oklahoma	9	17	846	809	1,655	2.48	1.29
Texas	30	30	3,733	2,272	6,005	1.69	0.96
West South Central	39	42	6,892	3,919	10,811	1.20	0.79
Montana	8	12	24	120	144	0.67	1.34
Idaho	15	28	44	165	209	0.44	0.34
Wyoming	5	5	7	1	8	1.26	0.01
Colorado	45	45	1,122	999	2,121	10.53	4.50
New Mexico	25	25	126	188	314	14.71	1.64
Arizona	11	26	29	17,562	17,591	0.22	26.93
Utah	13	20	175	343	518	4.34	2.54
Nevada	5	7	6	130	136	2.76	16.73
Mountain	67	86	1,533	19,508	21,041	3.53	10.92
Washington	15	53	3,649	2,975	6,624	11.55	5.83
Oregon	10	40	1,017	1,292	2,309	3.90	2.13
California	60	207	30,766	85,407	116,173	13.75	8.72
Pacific	67	244	35,432	89,674	125,106	12.89	8.22
United States	216	850	138,481	204,737	343,218	1.16	3.67

FERTILIZERS are manufactured in the United States for two purposes. The first and most important, is for production of commercial food, feed and fibre crops, and the second, for the growing of urban flower and vegetable gardens, ornamental trees and shrubs, and to improve and maintain lawns and turfs. Interest has been expressed by agronomists and others in the tonnage sold for the latter purposes. In the 1947-48 annual fertilizer survey by the United States Department of Agriculture, manufacturers were asked to report separately sales for such purposes. This paper summarizes the data which are classed as "non-farm use." The use of fertilizers by commercial nurseries is included as non-farm use, whereas that for commercial truck farms and gardens on farms is not.

The consumption of commercial fertilizers for non-farm use is estimated from this survey to have been 343,218 short tons in the year ended June 30, 1948. Compared to the overall use of fertilizers in the Continental United States for the corresponding year, 17,507,752 tons,[2] non-farm use is only 2 percent of the total. Sales of commercial mixed fertilizers for non-farm use amounted to 138,481 tons and separate materials for direct application to the soil 204,737 tons. In addition 130,000 tons of peat was also used. About one percent of all mixed fertilizers and 4 percent of all materials for direct application was consumed by other than farmers. The distribution of fertilizers for non-

[1] Presented at the 116th meeting of the American Chemical Society, Atlantic City, New Jersey, September 21, 1949.

[2] Walter Scholl and Hilda M. Wallace, Agricultural Chemicals 4, No. 6, 34-39, 81-83 (1949).

by
Walter Scholl
and
Hilda M. Wallace[3]

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farm use is shown geographically by Figure 1. The largest consuming area is on the Pacific Coast followed by the East North Central and Middle Atlantic regions. The South Central Region used the smallest amount.

The consumption of commercial fertilizers for non-farm use by states and regions is shown in Table 1. Included is a comparison of the number of grades used and the percentage of all fertilizers used in each state to the total. California used 116,173 tons, the largest quantity for any state. This is 9.66 percent of the state total. Seven other states each used more than 10 thousand tons, eleven between 5 and 10 thousand, eighteen between 1 and 5 thousand and the other twelve less than one thousand tons each.

Three grades, 5-10-5, 4-12-4

TABLE 2
Principal Fertilizer Grades Consumed For Non-Farm Use During Year Ended June 30, 1948.

Grade	Consumption	Proportion of Total	Region of Principal Consumption
	Tons	Percent	
5-10-5	31,955	23.08	North Central & Middle Atlantic
4-12-4	30,249	21.84	West North Central
6-10-4	24,620	17.78	Pacific
8-7-3	4,136	2.99	East North Central
10-6-4	3,880	2.80	E. N. Central & Mid. Atlantic
6-9-6	3,418	2.47	Pacific
3-12-12	3,193	2.30	East North Central
10-8-6	1,568	1.13	North Central
8-6-2	1,509	1.09	New England
8-6-4	1,484	1.07	New England
4-12-8	1,227	0.89	East North Central
11 Grades[1]	107,239	77.44	
5 Grades[2]	3,896	2.81	
22 Grades[3]	4,964	3.59	
180 Grades[4]	2,896	2.09	
Others[5]	19,486	14.07	
Total	138,481	100.00	

1/ All Grades with a volume of 1,000 tons or more
2/ " " " " " between 500 to 999 tons
3/ " " " " " " 100 to 499 tons
4/ " " " " " under 100 tons
5/ All other not specified by Grade

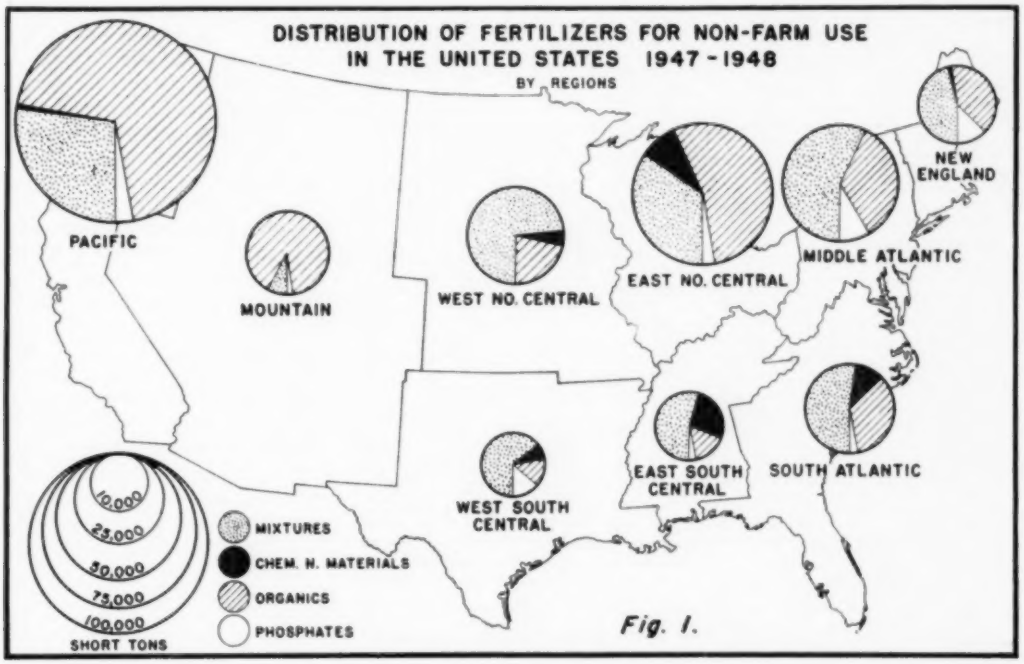

Fig. 1.

3 Acknowledgement is made to Arnon L. Mehring and K. D. Jacob for advice in preparing the report.

TABLE 3

Fertilizer Materials Consumed, As Such for Non-Farm Use During Year Ended June 30, 1948.[1]

States & Regions	Chemical Nitrogen[2]	Organics[3]	Phosphates[4]	All Other[5]	Total
	Tons	Tons	Tons	Tons	Tons
Maine	5	1,067	172	0	1,244
New Hampshire	1	274	95	0	370
Vermont	1	111	33	0	145
Massachusetts	36	3,947	854	0	4,837
Rhode Island	1	761	96	1	849
Connecticut	5	1,527	1,068	0	2,600
New England	49	7,677	2,318	1	10,045
New York	75	5,572	924	9	6,580
New Jersey	1	2,332	893	0	3,226
Pennsylvania	20	5,414	1,039	0	6,473
Delaware	0	123	41	0	164
District of Columbia	0	261	108	0	369
Maryland	7	739	313	0	1,059
West Virginia	0	223	16	0	239
Middle Atlantic	103	14,664	3,334	9	18,110
Virginia	72	397	300	0	769
North Carolina	325	2,088	96	0	2,509
South Carolina	25	165	30	0	220
Georgia	1,096	1,122	328	0	3,346
Florida	140	4,847	221	21	5,229
South Atlantic	2,458	8,619	975	21	12,073
Ohio	134	10,317	329	0	10,780
Indiana	78	1,797	14	0	1,889
Illinois	476	8,845	477	10	9,808
Michigan	3,959	7,478	100	0	11,537
Wisconsin	186	3,454	76	0	3,716
East North Central	4,833	31,891	996	10	37,730
Minnesota	74	2,375	69	0	2,518
Iowa	47	1,161	13	0	1,221
Missouri	440	2,138	99	0	2,677
North Dakota	0	0	0	0	0
South Dakota	0	31	0	0	31
Nebraska	725	198	0	0	923
Kansas	115	572	26	0	713
West North Central	1,401	6,475	207	0	8,083
Kentucky	55	422	44	0	521
Tennessee	431	857	223	0	1,511
Alabama	60	529	76	0	665
Mississippi	2,849	40	9	0	2,898
East South Central	3,395	1,848	352	0	5,595
Arkansas	0	6	12	0	18
Louisiana	180	169	671	0	1,020
Oklahoma	170	437	2	0	609
Texas	450	1,039	783	0	2,272
West South Central	800	1,651	1,468	0	3,919
Montana	0	120	0	0	120
Idaho	0	165	0	0	165
Wyoming	0	1	0	0	1
Colorado	81	711	80	127	999
New Mexico	1	101	0	86	188
Arizona	30	17,532	0	0	17,562
Utah	0	343	0	0	343
Nevada	0	130	0	0	130
Mountain	112	19,103	80	213	19,508
Washington	0	2,646	329	0	2,975
Oregon	0	860	432	0	1,292
California	151	83,588	1,611	57	85,407
Pacific	151	87,094	2,372	57	89,674
United States	13,302	179,022	12,102	311	204,737

1 Exclusive of 130,000 tons of peat also used in the United States for lawns and gardens.

2 Ammonium nitrate, 21; ammonium sulfate, 12,976; ammonium nitrate-limestone mixture, 1; calcium cyanamide, 280; sodium nitrate, 24.

3 Dried manures: cattle, 80,053; goat, 190; poultry, 1,699; sheep, 13,535; miscellaneous, 4,669; cottonseed meal, 7; compost, 510; fish scrap and meal, 9; sewage, activated and other, 78,350.

4 Bone meal: steamed, 5,082; raw, 6,483; superphosphate (18%-20%), 137; phosphate rock, 400.

5 Aluminum sulfate, 10; blood, 59; muck, 21; muriate of potash, 16; sulfur, 205.

and 6-10-4, led in sales for non-farm use. The combined tonnages of these three grades amounted to 86,824 tons. They constituted 62.7 percent of the total tonnage of 218 grades for non-farm use. All grades sold in volume of one thousand tons or more each and the region in which principally sold for non-farm use are shown in Table 2. Approximately one-fourth of the 850 grades manufactured for general crop use are sold also for non-farm use. Those grades with a nitrogen content below 8 percent are usually recommended for gardens, and flower beds. Those with 8 percent or more nitrogen are recommended for trees, shrubs, evergreens and turfs. Practically all are recommend for lawns by some manufacturers. Numerous specialty grades are produced in tablet, pellet and liquid forms. These are usually concentrated forms containing 40 to 60 percent of plant nutrients. Grades 11-15-20, 13-26-13 and 23-21-17 are representative of such types. These are produced for potted plants, flower boxes and small gardens. Novelty products, such as seedling pots of compressed dried manures mixed with plant-food containing chemicals, are also marketed.

Materials used in the formulation of fertilizers for non-farm use are generally the same as for the manufacture of fertilizer for farms. The principal materials used are ammonium sulfate, normal superphosphate and muriate of potash. Dolomitic limestone is commonly used as filler and conditioner. Vitamins B_1 and B_2, hormones and various secondary and trace elements are added in special formulations. Chemicals for control of weeds are also sometimes included. Tablets are often made from water-soluble compounds, such as diammonium phosphate and potassium nitrate. The use of these permits higher concentrations of plant-food elements in small volume packaging.

The principal fertilizer materials used as such are dried manures, sewage products, ammonium sulfate and bone meal. The tonnage of materials used is shown in Table 3. California and Arizona consume the largest tonnage of dried manures. In

(*Turn to Page 93*)

TABLE 4

Consumption of Plant Nutrients for Non-Farm Use During Year Ended June 30, 1948.

States & Regions	In Mixtures			In Materials			Proportion for Non-Farm Use		
	Nitrogen	Available P_2O_5	K_2O	Nitrogen	Available P_2O_5	K_2O	N	P_2O_5	K_2O
	Tons	Tons	Tons	Tons	Tons	Tons	Percent	Percent	Percent
Maine	29	60	30	33	67	25	0.41	0.47	0.18
New Hampshire	29	30	17	14	30	3	4.17	1.15	1.49
Vermont	37	89	9	5	11	2	4.38	0.96	0.50
Massachusetts	215	283	161	215	300	41	9.67	7.09	3.38
Rhode Island	76	119	61	37	41	7	12.60	7.76	4.60
Connecticut	160	216	102	88	320	25	5.53	8.34	2.96
New England	546	799	380	392	769	103	3.49	2.65	1.05
New York	527	853	394	293	325	156	3.55	1.50	1.31
New Jersey	251	440	213	110	261	40	2.84	2.61	1.23
Pennsylvania	163	332	160	240	346	69	2.35	0.92	0.37
Delaware	71	122	62	5	13	3	3.97	2.10	1.60
District of Columbia	18	28	18	10	15	6	28.86	27.22	24.71
Maryland	257	484	201	30	89	17	3.17	1.97	1.33
West Virginia	36	57	29	5	6	6	1.76	0.42	0.98
Middle Atlantic	1,343	2,316	1,074	693	1,057	297	3.03	1.46	1.25
Virginia	134	285	130	34	78	9	0.65	0.44	0.38
North Carolina	36	86	34	141	63	36	0.22	0.10	0.08
South Carolina	43	113	45	10	9	5	0.09	0.15	0.10
Georgia	134	311	137	459	106	12	0.96	0.37	0.24
Florida	429	604	561	237	172	43	1.92	1.48	1.23
South Atlantic	776	1,399	907	881	428	105	0.64	0.38	0.35
Ohio	318	384	199	619	360	24	4.17	0.69	0.36
Indiana	264	709	547	106	50	13	1.88	0.76	0.88
Illinois	335	594	317	530	361	76	6.25	1.30	1.00
Michigan	86	139	60	1,225	250	23	12.12	0.70	0.27
Wisconsin	200	427	203	218	121	19	3.13	0.94	0.86
East North Central	1,203	2,253	1,326	2,698	1,142	155	4.87	0.86	0.63
Minnesota	315	743	307	137	88	13	8.01	2.10	2.47
Iowa	72	149	61	75	41	5	1.29	0.42	0.47
Missouri	411	1,013	408	201	76	14	5.59	2.83	2.73
North Dakota	19	51	20	0	0	0	3.02	0.88	1.35
South Dakota	5	14	6	2	1	0	1.92	0.81	4.99
Nebraska	62	111	66	161	6	0	5.25	4.37	90.41
Kansas	92	229	85	43	18	10	3.12	1.36	7.29
West North Central	976	2,316	952	619	230	40	4.24	1.63	2.92
Kentucky	166	403	174	27	19	9	1.37	0.71	0.88
Tennessee	93	199	93	124	69	19	1.30	0.40	0.54
Alabama	79	145	73	30	30	12	0.19	0.17	0.20
Mississippi	36	52	33	600	4	0	0.97	0.12	0.13
East South Central	374	799	373	781	122	40	0.75	0.33	0.39
Arkansas	52	143	54	1	3	0	0.26	0.62	0.41
Louisiana	65	117	51	70	145	2	0.58	1.04	0.60
Oklahoma	37	98	38	57	11	1	4.99	1.32	2.53
Texas	208	445	168	170	199	6	1.93	0.97	1.69
West South Central	362	803	311	298	358	9	1.01	0.94	0.96
Montana	2	2	1	7	4	0	1.54	0.17	1.35
Idaho	5	5	1	4	3	2	0.32	0.27	0.61
Wyoming	0.6	0.6	0.3	0.01	-	-	0.23	0.04	1.67
Colorado	62	111	64	61	41	1	5.74	2.24	6.23
New Mexico	8	14	7	6	3	4	1.56	0.77	32.35
Arizona	2	3	2	350	228	351	4.52	2.94	75.39
Utah	12	25	8	15	6	3	1.89	.88	9.52
Nevada	0.5	0.9	0.1	10	4	1	30.88	2.53	7.35
Mountain	92	161	80	451	288	362	3.39	1.19	19.71
Washington	218	349	142	121	141	24	5.29	5.64	4.30
Oregon	61	97	36	48	111	7	1.56	1.99	1.57
California	2,323	3,501	1,640	2,029	2,024	1,332	4.17	10.01	20.58
Pacific	2,602	3,947	1,818	2,199	2,276	1,363	4.08	8.35	15.11
United States	8,274	14,792	7,221	9,012	6,670	2,474	2.10	1.17	1.09

Plant Disease and Forecasting Service Expands in 1949 . . . Control of diseases achieved using

FUNGICIDES

ONE of the interesting characteristics of plant diseases in general is their great degree of fluctuation from year to year in their occurrence, prevalence, and destructiveness. The diseases under consideration in the Crop Plant Disease Forecasting Project seem to be no exception. These diseases, late blight of potato and tomato (*Phytophthora infestans*), blue mold of tobacco (*Peronospora tabacina*), and downy mildew of cucurbits (*Pseudoperonospora cubensis*), were as widely distributed in 1949 as in the past three years but generally not as destructive. Figures 1 through 4 plot this year's distribution of these diseases and the short text will attempt to tell the highlights of the second year's observations under the Warning Service.

Potato Late Blight

INFECTION on potatoes with *P. infestans*, although reported from the numerous places shown in Figure 1, was of little economic importance this year. Sources of infection included cull piles, seed potatoes, the overwintering refuse resulting in infected volunteer plants, diseased seed, infected tubers, and airborne spores which produced scattered infection. Attack usually took place at from early maturity to full maturity, with infection local to general in occurrence and slight to moderate in effect. At the time of first appearance in the field estimated percentages of infection ranged from 5 to 100. At time of continued spread estimated percentage of infection ranged from a trace to 100, with losses ranging from a trace through slight to a high of 25 to 50 percent.

Weather reports from the various states show that, for the most part, rainfall was light, dews present, and temperature near normal to above normal prior to appearance of the

Fig 1-DISTRIBUTION of TOMATO LATE BLIGHT in 1949

Fig 2-DISTRIBUTION of POTATO LATE BLIGHT in 1949

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disease, although several states reported heavy rainfall before attack, with temperatures ranging from much below, to near normal. The warm wet and warm dry conditions prevailing this summer over the eastern to northeastern portion of the United States, probably because of the higher temperatures, prevented the production and dissemination of spores of the fungus.

Fig. 3 · DISTRIBUTION of TOBACCO BLUE MOLD in 1949

Fig. 4 · DISTRIBUTION of CUCURBIT DOWNY MILDEW in 1949

Fungicides used as sprays included "Dithane," "Parzate," tribasic coppers, Bordeaux, fixed coppers ("Basicop," "Perenox"), and "Dithane" and "Parzate" plus zinc sulfate. All fungicides gave good control when applied properly with adequate coverage. Five states, eastern Ontario, and Quebec reported that Bordeaux was used successfully by from 10 to 50 percent of the growers with good to excellent results. Dusts employed on potato were neutral copper, commercial dusts containing "Dithane Z-78" and "Parzate," "Copper A," and zinc carbamate, with good results obtained. One report listed poor results from the use of yellow copper oxide and copper lime. A schedule of fungicide results is given in tables 1 and 2.

Tomato Late Blight

TOMATO late blight likewise was unimportant nationally this year, although reported as severe by growers in several areas. Sources of inoculum were southern plants, carry-over on potatoes, infected potatoes in nearby fields, and scattered infections which suggested airborne spores. Plants were attacked when at young transplant stage, one-half maturity size, at maturity, and at late fruit set.

Infection for the most part was reported as general or local, with a few reports of scattered infection. Severe damage was reported at Leesburg, Florida, in May. In the Virginia mountain area, also, damage was severe at the time of continued spread of the disease, when there were some large fruits on the plants. Infection in Mississippi was general during the three stages (first appearance, continued spread, and reappearance), with severe damage at first cluster open, and severe to moderate damage on green mature fruit.

Estimated percentage of infection in fields ranged from a trace to 20 at time of first appearance, with higher ranges of 50 to 100 reported in areas more heavily affected. At time of continued spread the range

was as wide, i. e., from a trace to 100 percent, the most notable circumstance being the low infection in sprayed fields, which sometimes amounted to 5 to 10 percent as against 90 to 100 percent in unsprayed fields. Similarly, reduction in yield followed the same pattern, with slight reductions in sprayed fields and as high as 50 percent in unsprayed fields. One state reported up to 100 percent reduction in yield, but information was lacking as to whether the fields had been sprayed. In Mississippi, although area planted to tomatoes this year was estimated to be 1500 acres more than in 1948, the yield was less by 200 carloads. Part of this reduction was due to stem-end cracking of the fruit brought about by excessive rainfall prior to picking, part to buckeye rot (*Phytophthora parasitica* Dast.), while late blight fruit rot was said to be responsible for 30 percent of the total reduction.

Reports indicated that the increased use of fungicides for control of late blight on tomato, together with the dry summer, probably contributed to the low incidence of the disease. The materials used and their effectiveness in controlling tomato late blight are seen in Tables 1 and 2.

Tobacco Blue Mold

THE distribution of tobacco blue mold in 1949 is shown in Figure 3. The types of tobacco affected were flue-cured, burley, cigar-wrapper, Havana seed, broadleaf, and shade types. Sources of inoculum were either unknown or reported as old bed-sites. Infection was reported as scattered to local, with general infection noted over the eastern half of North Carolina. Damage was slight except for the Carolinas and Virginia, which experienced a severe blue mold year.

Rainfall was reported for the most part as moderate, above normal in a few cases, with temperatures near normal to above in all reported cases. Estimated percentage of infection ranged from 1 to 100. Reduction in plants in beds was slight, with an estimated high of 10 percent. However, in several cases 100 percent reduction was reported in plant-bed yields, particularly in unsprayed beds.

TABLE I — CONTROL OF LATE BLIGHT ON POTATO: Materials used as sprays and their effectiveness in 1949.

Fungicide or Material	State area or Prov.[1] N.E.	S.	M.W.	Pr.	Formula or Dosage	% using	% applied by Ground Mach. Airpl.	Results and Remarks
Bordeaux	5	1	1	2	8-8-100 (2)[2]	48,10	all (2)	Excellent
					10 5-100	25	all	Good
					8-16-16	10	100	Excellent
					4-2-40	25-30	100	Good
					4-4-40	50	100	Excellent
					100-125 gal./acre—10 day intervals		all	?
					4-4-50	5	all	Excellent
					8-4-100 Fixed copper-4lbs. of 50%	50	100	Good
Fixed Coppers		1	1	2	COC-S		all	Poor
						Approx. 2	all	Good
					1%	10		Good
								One state—no result listed
Basicop				1	COC-S	Approx. 2	all	Good
Perenox				1	COC-S	Approx. 5	all	Good
Neutral Coppers	2		1		2 lbs./100 gal.(1)	15	all	Excellent
					4 lbs./100 gal.(1)		all	Good
						20	all	Good
Copper Zinc "Chromate"			1				all	?
"Dithane" Liq.	1		2	1	2 qts./100 gal.(1)		100	Good
					2-3 qt./100 gal. (1)	45	all	Good
					100-125 gal./acre-10 day intervals		all	?
"Dithane" Dry	1				1½/100	4	all	Good
"Dithane D-14+" Zn SO_4	1	2			2 qt.-1 lb./100 gal. (1)	95	100	Excellent
					2 qt./100 gal.(1)	20	100	Good
"Dithane"						2		Good
Biscarbamates "Dithane" + "Parzate"	1				2 qts. + 1 lb. Zinc Sulphate	23	100	Fairly Good
Biscarbamates early + copper late in season	1					25	100	Good
"Parzate" Liq.	1				2-3 qt./100	45	all	Good
"Parzate" Dry	1		2		1½ lbs./100 gals.(2)	4(2)	100	Good
							100	Good
					100-125 gals./acre-10 day intervals		all	?
"Parzate" + Zn SO_4		1			2 qt. ¾ lb./100	5	100	Excellent
"Parzate"	(some results given under Biscarbamates: See above)							
CONTROL OF LATE BLIGHT ON TOMATO: (spray materials—continued)								
Bordeaux (included in other sprays: See under *Fixed Copper, Zerlate.*)	1							
Bordeaux	1		1		4-4-100 8-8-100 8-8-100	15	all	Good. Used after infection started. Control good except where fruit was badly cracked
	1	1	1		8-6-100	10	100	Good
					5-5-50	50	100	Good
					3-4-50	5		Excellent
Compound A	1	1			2/100 gal.	2	100	Good
					4/100 gal.	5	all	Clear-cut results obscured because of dry spell three-fourths of May
Fixed Coppers (included in other sprays: see under Zerlate)	1							
Fixed Copper	3	1			tank mix—2 lbs. of 50% Fixed Copper + 1 lb. Zerlate in all or most sprays	3	100	Good
					4 lbs. 50% Cu./acre or Bordo 3-6-100	9	100	Good
					2 lb. actual/100 gal.	75	99.5	Excellent
					1% Cu	10		Good
Copper		1			2/100 gal.	10	100	When spray started on time and repeated once each week and after each rain, very good results obtained
Neutral Coppers	1					20	all	Good
Tribasic Copper Sulphate	1	1			2 lbs./100 gal.	15	100	Excellent
					4 lbs./100 gal.	?		Clear-cut results obscured because of dry spell in May
"Dithane" or "Parzate"	1					1	1	Fairly good
"Dithane Z-78"	1				2-100	Trace	all	Excellent
"Dithane D-14+" Zn SO_4	1	1			2 qt. + 1 lb./100	95	100	Fairly good to excellent depending on application
						Trace	all	Excellent

Fungicide or Material	State area or Prov.[1] N.E.	S.	M.W.	Pr.	Formula or Dosage	% using	% applied by Ground Mach.	Airpl.	Results and Remarks
"Parzate" (see under "Dithane")									
"Parzate"		2			2 lbs./100	all			When sprays started on time and repeated once each week and after each rain, very good results obtained
						?			Clear-cut results obscured because of dry spell during three-fourths of May
"Parzate" Z-78	1				1½/100	5	all		Good
"Parzate" Liq. + Zn SO_4		1			2 qt./⅜ lb.	5	100		Fair to excellent depending on application
"Zerlate" (included in other sprays: See under Fixed Copper)									
"Zerlate" spray	1				1-2-3 (2 lbs.) + Bordeaux 3-6-100 or Fixed copper 4 lbs. in sprays 4-5-6	83	100		Good
"Zerlate" followed by copper	1					5	all		Good
"Zerlate" alternating with copper			1			50	all		Control good where last two sprays were copper, poor where last spray was Zerlate
Zinc dimethyl Dithiocarbamate	1				2/100	75	99.5		Excellent
CONTROL OF CUCURBIT DOWNY MILDEW: (spray materials—continued)									
Bordeaux	1	1			cuc. 7-4-100 melons 4-2-100 4-4-50[1]	35	95		(No results given)
						50	100		Good. In certain fields anthracnose caused very severe damage where materials gave poor control
Fixed Copper	2				4 lbs. 50% 4-100	40	95		(No results given) Good. When used in time, held the disease in check
"Tribasic"	1				3-100 (melons)	10	100		Excellent
"Dithane D-14" + Zn SO_4		1			2 qts., ½ lb.	all	all		Generally good
"Dithane Z-78"	2				2-100[1]				Good. When used in time, held the disease in check
					no formula—(melons)	5-7	100		Excellent
"Zerlate"	1				2-100 (melons)	5-7	100		Excellent
CONTROL OF BLUE MOLD OF TOBACCO: (spray materials—continued)									
Copper or Bordeaux	1				4 lbs. fixed Cu.	24	100		Fairly good
"Fermate"	3	2			3 lbs., 100[1]	50	100		About 25% received excellent results, 50% good and 25% none or no control. Results depended on how good a job done
						66	100		Good
					1-2 lbs./100	95	99		Excellent
					4-100	50	all		Excellent to good
					no formula	10		none	Good
"Fermate"—"Karbam"		1			2-100-4-100	70	all		Mostly good
"Ferbam"		1			2-3 lb./100 gal.	15			Good
"Dithane"		1				50		none	Good
"Parzate Z-78"	1					Trace			(No results given)
P. D. B.						100		none	Good

[1] Explanation of abbreviations:

N.E. = Northeastern states: Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, and Ohio.
S. = Southern states: Virginia, Kentucky, North Carolina, South Carolina, Tennessee, Arkansas, Oklahoma, Texas, Louisiana, Mississippi, Alabama, Georgia, and Florida.
M.W. = Mid-western states: Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, South Dakota, and North Dakota.
Pr. = Canadian Provinces: Prince Edward Island, Nova Scotia, New Brunswick, Quebec, and Ontario.

[1] ( ) Numbers in parentheses refer to number of states or provinces using same formula; and, likewise, number of states or provinces with same percentage of growers using where ( ) appears in "% using" column.

Where control measures were employed soon enough excellent results were obtained. In South Carolina, stunting of plants was induced when the grower used "Fermate" dusts with Kaolin diluent. No stunting was reported experienced when "Fermate"-Pyrophyllite mixtures were used and no injury was noted to plants.

Cucurbit Downy Mildew

DOWNY mildew of cucurbits is shown in Figure 4 as being, for the most part, present over the eastern coastline states. Acreages involved averaged about 1000 for Pennsylvania and Louisiana, and ranged from 1000 to 5000 in Delaware and Maryland. Sources of inoculum were either unknown, or reported as older plants, spring crop and garden plants, and for northern regions spread from plantings of cucurbits in more southerly regions. In Florida the organism is endemic and wild cucurbits might possibly constitute an additional source of inoculum. Infection occurred from first fruit-set to maturity, with marked activity at time of harvest; it was reported as local in Connecticut, local to general in New York, and general in Pennsylvania, Florida, Virginia, Louisiana, South Carolina, Maryland, and Delaware. Damage at start was slight. During the time of continued spread it was generally described as moderate, but severe damage was reported in Connecticut, Virginia, Louisiana, South Carolina, Arkansas, and Maryland.

Weather conditions accompanying infection were consistently reported as light rainfall prior to appearance of the disease, with moderate rainfall during period of greatest attack and spread. Dews were universally reported.

The most notable event connected with occurrence of downy mildew of cucurbits this year was the loss of the cantaloup crop in South Carolina. Acreage is extensive in this state, while dusting and spraying for control have not been accepted by the vast majority. All of the loss in reduced financial returns and reduced yield in this crop this year can be attributed to downy mildew, which was reported in the worst epidemic form in this state since 1938. Downy mildew was severe on cucumbers also in South Carolina, killing almost 100 percent of the vines in ten days to two weeks after its first appearance.

(*Turn to Page 73*)

University of Illinois Scene of 2nd Annual School for State's

Custom Spray Operators

Below: Dr. Julius M. Coon, (L) University of Chicago toxicologist, and L. Keden, U. of Ill. Second photo: Dr. E. W. Lehmann, Head, Department of Agricultural Engineering, U. of Ill.; Frank Irons, Sr. Agri. Engineer, U.S D.A., Toledo, Ohio; and George E. Pickard, U. of Ill. Agri. Engineering Dept. Third picture: Earl Davies, Gardner, Ill., pres. of Ground Sprayers Ass'n.; J. L. Helphinstine, Decatur, Ill.; Robert Kirkpatrick, Princeton, Ill., secretary of Ground Sprayers Association; and Virgil Helgen, president of Ill. Aerial Sprayers Association. Bottom photograph: W. O. Scott and R. P. Link, both of U. of Illinois.

PROBLEMS facing the custom operators of both ground and air equipment were discussed thoroughly at the second annual Spray Operators Training school held January 17-19 at the University of Illinois, Urbana. The meeting, sponsored by the University's College of Agriculture Extension Service; the College of Veterinary Medicine; the Illinois Natural History Survey and the Institute of Aviation, was attended by some 350 persons.

Entomologists, toxicologists, plant pathologists, equipment experts and the agricultural press were represented on the three-day program. Two evening symposia, one covering the problems of the air operator and the other, those of the ground operator, brought out many additional points of interest to the conference attendants.

Dr. Julius M. Coon, director of the toxicity laboratory of the University of Chicago Medical School told the operators that they must strike a balance between "too much fear and too little respect" of and for the new organic insecticides which are extremely toxic. He reminded of the insidious effect of toxicants such as parathion and tetraethyl pyrophosphate which do not irritate the skin and thus give no warning that they are present on the skin. Since these and other insecticides may gain entrance into the human body by inhalation, by ingestion, or by penetration through the skin or eyes during operations, Dr. Coon emphasized that all workers must become acquainted with the toxic potentialities of these materials, and observe strictly the recommended precautions for handling them.

Equipment Discussed

THAT there remain numerous mechanical problems in the application of agricultural chemicals, was emphasized by Frank Irons, senior agricultural engineer, U. S. Department of Agriculture, Toledo, Ohio. He pointed out some of the hazards of low gallonage spraying, stating that such application is "tricky," since even slight changes in the travel speed of an applicator or the wearing of nozzle openings to allow greater amounts of the liquid to pass, change the rate of application to a considerable extent.

The need for agitators on machines was emphasized, particularly where emulsions are involved. He pointed out that without an agitator, the emulsion separates so that at first the material is applied in too great a concentration, then later, with the toxic matter spent, the application consists mostly of water. The matter of safety to the operator was discussed, with Mr. Irons recommending that the spray boom be placed behind the operator so that he will not be in the path of the spray.

High clearance machines for spraying tall corn were described as being good in principle, but needing perhaps another year or two to perfect. Lack of adequate power was given as the principal difficulty to overcome in high clearance machines.

Corn Borer Control

CONTROL of corn borer in Illinois is a goal much-sought-after by custom operators in that state. J. H. Bigger and Dr. George C. Decker, Illinois Natural History Survey, discussed the methods of control at length during the meeting. In des-

cribing control of the borer in field corn, Mr. Bigger stated that DDT is the most easily available, effective, and relatively inexpensive material for this purpose. It should be used at the rate of about 1½ pounds of actual DDT per acre, he said. Timing is of utmost importance in either spraying or dusting. One application may be sufficient in cases of light infestation, but two are necessary when heavy populations are present. Proper timing is related both to the size of the corn and the number of borer eggs present. Small corn with many eggs is not in as much danger as tall corn with fewer eggs present or hatched. Mr. Bigger urged the operators to learn to count egg masses in order to know how to proceed with control measures. He said that the potential for 1950 is for "very severe damage."

Dr. Decker continued the discussion in explaining control measures for borer control in sweet corn. In market corn, he said, Ryania and DDT dusts are suggested; the former to be applied at the rate of 40 pounds of dust per acre. (40% Ryania) DDT should be applied at the rate of 30 pounds per acre, in 5% dust. As sprays, these same insecticides may be used in water. Between 100 and 150 gallons of spray per acre should be used, using three nozzles per row. Here, too, timing is important, Dr. Decker emphasized. Treatments should be started with the first evidence of egghatching, and applications should be repeated at five-day intervals. He pointed out that five or six applications may be needed if over five egg masses per plant are found.

In canning corn, practically the same procedure is to be followed. Neither DDT nor Ryania will leave any harmful residue on the husked ears, but the husks and leaves will carry some DDT, he said. These should not be fed to dairy cattle, but the Ryania-treated husks will be harmless.

The defoliation of crops was discussed by R. F. Fuelleman, professor of crop production, Department of Agronomy, University of Illinois. He pointed out the advantages of defoliants on soybeans, stating that this makes possible earlier harvesting and speeding up maturity; lowers the moisture content which allows safer storage and improved quality; permits harvest before fall rains; and it may knock the leaves from weeds, making them pass easily through the combine.

Among the chemical compounds mentioned in connection with defoliation, Mr. Fuelleman named calcium cyanamid, ammonium thiocyanate, diesel oil plus 2,4-D; oil fractions plus pentachlorophenol; potassium cyanate; 2,4-D; and "EC-3740," an organic chemical. It was emphasized that although all experiments were promising, none increased yields. Neither were any yields decreased, but the mechanical advantages gained were considered worthwhile.

Brush control and the cleaning up of drainage ditches were considered by L. B. Culver, extension forester of the Univ. of Illinois. Applied as foliage sprays from late spring to midsummer, ester formulations of 2,4-D and 2,4,5-T in combination have been found effective as follows: At one thousand parts per million, the material controlled blackberry; cherry; elderberry; wild grape and willow. At 4,000 ppm, it controlled river birch; cottonwood; American slippery and winged elm; Hawthorn and poison ivy. At 6,000 ppm, control was listed for green ash; buckbrush; dogwood; greenbrier; red

In the Photos

Top picture: Panel at ground sprayer symposium: (L. to R.) F. L. Lane, Wesley Copper, J. A. Garland, Earl Davies, L. H. Pressley and H. B. Petty. Next photo: L. J. Noordhoff, U. of Ill. Extension Service; Mr. Petty; Dr. George C. Decker and R. O. Hall, of Batavia, Ill. Third from top (L to R): W. R. Fisher, Campbell, California; L. C. Zimmerly, Peoria, Ill. and R. R. Owen, Wilmington, Del. Fourth from top: Don Weber, Spraying Systems, Bellwood, Ill.; J. D. Williams, Ill. Dept. Public Health, Springfield; and R. D. Murrill, U. S. Public Health Service, Chicago. Second from bottom: Robert J. Knaus, Thompson Hayward Co., Chicago; Joe Wright, Eldred, Ill.; and Ray DeLong, St. Louis, Mo. Lower photo: Registration committee, all from Ill. Natural History Survey offices: (L to R) Hellen Kesler, Sue Watkins and Marifran Martin.

and black gum; hickory; honeysuckle; black and honey locust; red and silver maple; white, blackjack, scarlet and red oaks; wild plum; redbud; sassafras; sumacs; sycamore, and tuliptree.

Walter O. Scott, Department of Agronomy, Univ. of Ill., described efforts to control Canada thistle, wild garlic and onions. Canada thistle, he said, may be controlled by 2,4-D, but several applications over a period of years are usually required. The ester formulations of 2,4-D are preferred, he declared, and went on to say that experiments to date show no advantage for 2,4,5-T or any combination of it with 2,4-D over the ester of 2,4-D alone. Wild garlic is difficult to control with 2,4-D, he said, but the results justify its use. Early winter applications of 2,4-D show most promise, but Mr. Scott warned that fall and winter applications of 2,4-D to winter wheat will do damage to yield. Treatments at this time should be limited to areas not sown to fall-seeded small grains. Wild onions are easier to control with 2,4-D. The same precautions mentioned for wild garlic apply to control of onions. No advantage has been noted from using detergents or oil with 2,4-D in controlling wild garlic. And 2,4,5-T has proved no more effective than 2,4-D in controlling this weed, it was stated.

Declaring that airplane spraying is here to stay if reasonable precautions are taken, George E. Pickard, Univ. of Ill. Department of Agricultural Engineering, pointed out that although drift is a problem in the application of insecticides and fungicides, in the case of herbicides it is of particular importance. The extent to which drift can be controlled or safely disregarded as far as crop damage is concerned, is the measure of the continuing use of aircraft for weed control, he said. Suggestions for airplane operators included the use of low-pressure, high volume spray with large nozzles to give large droplets.

Below (L to R) George Young, Lexington, Ky.; William Vogel, La Salle, Ill.; Dr. Harlow B. Mills, chief, and John H. Bigger, entomologist, Illinois Natural History Survey, Urbana; and Roy Schafsky, Geneseo, Ill. Bottom: August Stadler, Manteno, Ill.; L. B. Cuver, Illinois Natural History Survey, Urbana, Ill.; Dr. J. C. Carter plant pathologist of the Illinois Natural History Survey, Urbana; Robert Kirkpatrick; and Wesley Cooper, Morrison, Ill.

Aerial Symposium

A SYMPOSIUM on aerial spraying and dusting was held Tuesday evening with Virgil Helgen, Decatur, Ill., as chairman of a panel which answered questions asked by the group. Other members of the panel included William Vogel, LaSalle, Ill.; J. L. Sons, Milford, Ill.; Lee Ruebush, Roseville, Ill.; and Joe Wright, St. Louis, Mo. Topics for discussion were rather broad in scope, but included chiefly matters of insurance, operators' liability, laws and regulations, cooperation with other interested groups such as ground operators and the potentialities for improvement in equipment such as the possible development of a new low-cost helicopter which is said to be in the offing.

Lawsuits Discussed

THE problem of lawsuits was discussed, with the question being raised of how prevalent lawsuits are in connection with custom spraying operations. Subsequent remarks revealed that there is actually no pattern, since such matters vary with the excellence of the operator's work and his knowledge of what he is doing. It was brought out that one single operator now has lawsuits against him totaling some $425,000 . . . that most of the trouble has arisen from the use of herbicides too near cotton plantings. The fliers agreed that such situations are almost always the result of "going out and spraying indiscriminately," as one operator put it.

The question of adequate insurance to cover damages such as the defoliation of tobacco was raised. Representatives of insurance companies, present at the session, told the group that liability rates are "quite high," and as a result not many operators carry chemical insurance. It was pointed out that chemical manufacturers are not to be held responsible in such losses.

Asked "how much insurance should I carry," the panel concluded, after a brief discussion, that one should carry enough so that he can pay any likely damage suit without having to sell his business to do it. Dealers, it was pointed out, have a contingent liability, even though they may not own nor operate planes themselves. Types of insurance ordinarily carried by operators are public liability and property damage, it was pointed out. Limits on both of these may be increased at any time at relatively low rates, the insurance men said, and the policies may or may not include chemical damage clauses.

Complaints about the high cost of workmen's compensation rates were aired by the operators. However, as the discussion progressed, it was pointed out that reduction of these rates is almost entirely the responsibility of the operators themselves, in lowering accident rates. The insurance companies do not set the rates, it was stated. . . . these are governed entirely by the ratio of injuries and fatalities which occur. Crash helmets, shoulder straps and other safety devices will not cure the trouble, it was said, but anything which reduces the total loss figures will work toward more favorable rates.

That the custom spraying business is out of its infancy was emphasized by Mr. Wright of the

panel, who has been flying since 1925. "The public must be convinced that we are not a bunch of 'hot rods'," he declared. "There is no fancy stuff with crop dusting any more. . . . it is a hard-boiled business now, and we must cut down on the glamor." He urged the legitimate operators to build up confidence in the minds of farmers in their area by knowing what they are talking about in discussing pest control.

A mechanical discussion on booms, nozzles, pumps and shut-off valves followed. These were described as being of utmost importance by the panel, because of the necessity of avoiding dripping of toxicants on the turf after spraying a particular field. It was decided that the pump could be utilized to remove all liquid from the boom and nozzles, or the material might be allowed to flow back into the tank by gravity.

The necessity of having a strong organization of custom operators was stressed in the discussion. It was pointed out that laws in several states are "hanging fire," and some of these proposed rules are stringent and restrictive. President Helgen urged the group to make its influence felt in legislative halls, and not to wait until unfavorable legislation is passed before doing anything about it. "We need to articulate, and to carry some weight," he declared. He continued by saying that the group could sponsor its own legislation which could be fair and workable.

Membership in such an organization should be a criterion recognized by growers, it was stated. The term "license" should be changed to "certificate," one flier stated, so that it connotes knowledge on the part of the operator beyond mere ability to fly an airplane. The operator who aims only to make a "quick dollar" without regard to future business, was roundly condemned by the group.

Ground Symposium

A SECOND symposium, held Wednesday evening, regarded problems of ground spraying. This meeting, presided over by Earl Davies, Gardner, Ill., president of the ground sprayer's organization, heard numerous problems discussed on matters of insurance, contracts, and methods of pest control. A panel, headed by Mr. Davies, was composed of L. H. Presley, Washington, Ill., Joseph Garland, Dixon, Ill.; Wesley Cooper, Morrison, Ill.; and F. L. Lane, Mercer County, Ill.

A discussion on better yields of corn following the application of 2,4-D for weed control in the field, indicated that this experience was general. Mr. Lane of the panel stated that he had observed results in his own field, where an extra heavy application of 2,4-D had apparently damaged the corn but by harvest time it had recovered and produced more corn than some of the other less-treated stalks.

Brittleness in corstalks resulting from use of 2,4-D was brought up, with several operators stating that trouble had been experienced along this line. Just why 2,4-D acts this way in corn is not known, but it was pointed out that if the spray is directed to the lower portions of the plant it will be better. Mr. Garland of the panel observed that too much wind plays a part in the breaking of stalks, but Mr. Presley stated that the more fertile the soil is, the more marked will be the corn brittleness. He noted further that when the air is unusually humid, brittle conditions increase.

Corn is not injured by 2,4-D one operator pointed out, when it is just coming through the ground, or when it is less than three inches tall. He recommended use of up to 1½ pounds of the acid. "If you do a good job on small corn, the problem is licked," he said. Thus, the first cultivation is eliminated, and the yield is increased because the cultivator breaks more corn than many realize. The group stated that use of 2,4-D on corn tends to stimulate the plant, helps to strengthen roots and aids it to resist hot, dry weather.

As was the case in the previous symposium, the question of insurance provided a lively topic for discussion. The difficulty of obtaining insurance on chemical damage was brought up, with a number of operators complaining that a vicious circle obtains with the insurance companies insisting that the operator follow instructions on labels to the letter; while the labels advise seeking counsel from local authorities before proceeding. The question of whether or not the average custom operator exceeds the recommended concentrations of toxicants was not decided with any finality, since some indicated that at times the recommended dosages were exceeded. It was strongly urged, however, that all suggestions on labels should be obeyed completely. Regarding 2,4-D, one operator stated that "We have to learn how to use it. It has a place in corn and other crops *if* properly used. If the application looks doubtful, it is better to pass it up," was his advice.

The subject of workmen's compensation also spurred considerable discussion. One operator complained that his insurance company cancelled his compensation policy when it found that his men were engaged in spraying. Another pointed out that this couldn't be done legally, since state law requires an operator to carry such insurance on his men. Thus, an insurance company is obliged to assume the risk, he opined.

Great interest on the part of the ground operators was shown in the control of corn borer. Dr. Decker and Mr. Bigger, present at the symposium, were called upon for suggestions for control of this pest. They reiterated their previous statements on the use of insecticides, emphasizing anew the necessity for timing. Counting of egg masses was restated as being of importance in determining number of applications.

Officers of the two operators' associations were re-elected, although the airplane sprayers' group was to meet on February 17 to name new officers. The Illinois Ground Operators officers include Earl Davies, president; Leslie H. Presley, vice-president, and Robert J. Kirkpatrick, Princeton, Ill., secretary-treasurer.

Airplane operators officers include Virgil Helgen, Decatur, Ill., president and Earl Taynor, Champaign, Ill., vice-president.

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IN a report to be made public early in March, the Federal Trade Commission levies a number of strong charges against the fertilizer industry which fertilizer manufacturers have been quick to counter. The FTC report refers particularly to "an archaic, expensive, system of distribution" which is described as one of the "barriers retarding the use of commercial fertilizers." As an alternative to the industry's alleged "wasteful and expensive" system of distribution, the FTC offers several suggestions which they indicate, in theory at least, might result in substantial savings to fertilizer buyers. These include schemes for encouraging the sale of "high-analysis" fertilizers, permitting farmers to buy fertilizers on a plant food rather than on a tonnage basis, locating producing plants closer to consuming areas, and permitting the farmer to buy plant food as separate chemicals which he can mix or have mixed to his own specifications.

The FTC report notes the "vital importance" of the fertilizer industry, but passes over any tribute to its remarkable wartime and postwar record in keeping the farmers of the country supplied with adequate fertilizer stocks. Nor is any mention made of the industry's long-term record of lowering the cost of fertilizer as compared with real prices of other commodities the farmer buys and of the crop he sells.

While there is no suggestion in the report of any recommendation to the Department of Justice for new anti-trust prosecution, there is the implied threat to the industry throughout of further intervention of the government in the fertilizer business because of a need which the FTC apparently sees for a "national fertilizer policy and program." The farmer's desire to reduce plant food costs, the FTC alleges, "can be completely realized only by what would amount to a far-reaching change in the industry's method of distribution. . . . Such far-reaching change is proposed in legislation introduced in the 78th, 79th and 80th Congresses, designed to bring fertilizer materials to the farmer at lower cost."

The legislation to which the FTC report refers is of course the measure introduced by Senator Hill (Dem. Ala.) which he has indicated he would reintroduce at this session. Among other things it would authorize the production of high-grade superphosphates by the Tennessee Valley Authority and their free distribution to farmers.

The fertilizer industry was quick to brand the FTC charges as "unfair and unwarranted" and indicative of a further governmental trend toward socialization of American industry. It was pointed out that many small fertilizer manufacturers are not equipped for the production of high-analysis fertilizers and could be forced out of business by hasty or ill-advised legislation. Other industry spokesmen pointed out that the efforts of some factors in the field to encourage the sale of high-analysis mixtures have in many instances met with strong resistance from farmers who seem unwilling to pay the higher per pound costs and prefer to adhere to long standing habits in purchase and use of fertilizers. As one manufacturer phrased his reply to a question dealing with the report, he recognized as his "prime economic and social responsibility the obligation to supply

(*Turn to Page 75*)

AT the risk of stating the obvious, may we remind our readers that the accompanying account dealing with the report of the FTC on the fertilizer industry is printed merely to familiarize any of our readers who may not have had access to the report as yet with the general nature of the "charges" contained in it. The report itself—a 300 page document—is currently being printed by the U. S. Government Printing Office and will be ready for distribution shortly. Our own editorial views on the validity of the FTC's charges are contained in an editorial on Page 21 of this issue.

Scheduled for publication in our March issue is a symposium in which we hope to present the reaction of the industry to this FTC report which has been widely critized as unwarranted and unfair. If you desire to have your own views represented in this symposium, we shall be glad to have you write to us.

The Editors.

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New Trends Noted In Agricultural Insecticides

by

Melvin Goldberg
Pesticide Advisory Service

A NUMBER of new insecticides have recently been announced that will be available for continued field and experimental use during the coming season. Reports of field trials during the 1948-49 season were discussed at the recent meeting in Tampa, Fla., of the American Association of Economic Entomologists and recommendations were made on some of the compounds for actual use. These newer materials include several new organic thiophosphates, two new products having a nitroparaffin base, and the materials bearing the coined common names, dieldrin and aldrin.

Of particular interst also at this time in gauging the way the agricultural insecticide field is headed, product-wise, is the significant trend towards the use of emulsifiable concentrates in the control of cotton insects. Reports on work with sprays this past season were presented at the Montgomery, Alabama sessions of the National Cotton Council, and workers from several of the cotton states also presented their field results at the Tampa meetings. There is a significant trend towards the use of sprays for the control of many of the cotton insects; and the reports, while conservative in their statements, indicate that further tests in 1949 showed that concentrate sprays applied with both ground equipment and airplanes gave cotton insect control equal to that obtained with dusts.

Sprays apparently have a wide range of usage. They can be applied during most of the daylight hours even under conditions of relatively strong winds. It was also indicated that in some instances a given unit of toxicant applied in the form of spray was more economical than when applied as a dust. Boll weevil control has been obtained with as little as 0.5 gals. or as much as 10 gals. of spray per acre with the toxicant remaining constant at the recommended rate. Sprays were applied successfully to cotton for the control of boll weevil, boll worm, pink boll worm, thrip, cotton flea hopper, tarnished plant bug, rapid plant bug and cotton aphid. DDT in combination with toxaphene and/or benzene hexachloride was used in these tests and although there was some slight foliage burning in some instances, this will probably be worked out ultimately by more careful formulation. Tests on experimental oils indicated that the viscosity and volatility of the oil and its aromatic content are the main factors causing the undesirable foliage reaction. Solvents with the lowest boiling range and aromatic content which will dissolve the toxicant are the most desirable for use in emulsifiable concentrates. Formulators were urged to test emulsifiers and solvents for toxicity to the cotton plant before use in actual field work.

Many of the states, in connection with their cotton recommendations for 1949-50 control, specifically recommend the use of emulsifiable concentrates. Specifically the states of Texas, South Carolina, Mississippi, and Arkansas recommend the use of emulsifiable concentrates for the coming season under actual field conditions. Other states have recommended continuing field work.

The newer thiophosphates which were reported on in detail in a special symposium at the Tampa meeting of the A.A.E.E. include a compound introduced by the Grasselli Division of the Dupont Company which they have designated as EPN; and a new compound introduced by the Geary Chemical Corp. under the name "Metaphos" (originally called "Gearphos"). The data listed on these various compounds in this article come either directly from the companies themselves or from workers who reported on their own experimental work during the past season. No doubt more specific information will be available throughout the coming year.

EPN-ethyl-p-nitrophenol thionobenzene phosphonate

The Grasselli Chemicals Division of the Dupont Company has developed a new compound which they have called E.P.N. Preliminary results indicate that this product has the high toxicity to mites that is demonstrated by other of the organic phosphorous compounds, and it also shows promise as being the safest to use among the effective compounds of this class uncovered to date. However, it is still in the toxic class and all precautions are given for safe handling.

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Northeastern Weed Conference Elects Dr. H. L. Yowell . . . Reports Action of

New Herbicides

Above: Dr. H. L. Yowell, newly-elected president of Northeastern Weed Control Conference.

Plans for cooperative program outlined . . . Cardon Says Federal Government will increase weed control efforts . . . many new materials are discussed

THE fourth annual Northeastern Weed Control Conference, meeting at the Hotel New Yorker, New York January 3-5, named H. L. Yowell president of the group for 1950. The new head, connected with the Esso Laboratories, Elizabeth, N. J., succeeds Dr. Robert D. Sweet, Cornell University, Ithaca, New York.

Other officers named at the meeting included S. M. Raleigh, Pennsylvania State College, State College, Pa., vice-president to succeed Mr. Yowell; and Walter S. Jacob, Long Island Vegetable Research Farm, Riverhead, N. Y., secretary-treasurer, to succeed Dr. Dale E. Wolf, E. I. duPont de Nemours & Co., Inc., Wilmington, Del.

Reports of research and technical papers on herbicides for control of weeds in horticultural crops, agronomic crops, turf, and lawns featured the three-day conference. Dr. P. V. Cardon, U. S. Department of Agriculture, administrator of the Agricultural Research Administration, speaking at the annual banquet on January 4, told the group that the Federal Government is interested in increasing the fight against weeds. He described how the establishment of a new division will work toward this end. This division will be responsible for all weed work of the bureau and its integrated approach will be open to weed research carried on by other agencies of the department, he explained. He commended the four regional weed control conferences for their bringing together facilities and resources for weed research.

"These efforts point the way to what will be required to do away with the burden of weeds which rests heavily on American farmers," he said. "Initiative, resourcefulness and teamwork will help us to reach the goal of freeing the farmer from weeds." He went on to say that although the time may never come when the farm will be entirely free of weeds, "I, for one, believe that we should aim our work toward that end."

Dr. K. S. Quisenberry, agronomist in charge of cereal crops and diseases of the Bureau of Plant Industry, Soils and Agricultural Engineering, Beltsville, Md., discussed plans for new cooperative projects on weed research in 1950 and 1951. "Plans are being developed," he reported, "for work with weeds that are serious in the vegetable regions, probably increasing and strengthening the work in the northeastern region and starting some new work in the south. In addition, consideration is being given to strengthening the work in the cotton area by starting some work in the coastal plains and in the San Joaquin Valley of California." He mentioned also the importance of brush control and range management in the southwest where mesquite and other brushy plants are a problem.

Dr. Quisenberry emphasized the need for a separate bibliography covering the field of weed control, and declared that he would welcome suggestions along this line. Describing the project as a "real task," he pointed out some of the difficulties and problems to be overcome in establishing such a bibliography.

The persistence of herbicides in soils was discussed in a paper presented by A. G. Norman and A. S. Newman, Biological Department of the U. S. Chemical Corps, Camp Detrick, Frederick, Md. They concluded that no generalization can be made safely without reference to soil and climate conditions. The physical properties and chemical nature of the herbicides, on one hand, and the microbiological environment of the soil, on the other, decide the persistence of these materials in the soil. This, the paper stated, accounts for apparent inconsistencies in results of field studies on persistence carried out in different parts of the country.

"Pentachlorophenol as a Herbicide" was presented by Dr. L. V. Sherwood, agronomist, Monsanto

Chemical Co., St. Louis, Mo. He said that although pentachlorophenol and its derivatives exhibit toxic effects on all vegetation which they contact, yet these materials may be used selectively to kill weeds in certain crops if proper application procedures are used.

He stated further that defoliation experiments have proved to be of definite value in harvesting soy beans. Fall applications of penta in combination with 2,4-D not only permitted earlier combining while most the crop was still upright and more beans could be recovered, but made harvesting easier and faster by drying or removing the weeds which normally would clog the combine. It was also pointed out that in addition, market dockage of beans due to the presence of weed seeds was reduced or completely eliminated.

Other experiments were made in hops, he related. Here, pentachlorophenol was used as a combined herbicide and pruning agent. Four treatments were made at monthly intervals in the test, with satisfactory results. Such applications "serve to point the way toward experiments in related fields, such as cotton defoliation, pre-harvest leaf-drying of corn, sugar cane, rice and other crops," he declared.

Weeds in Corn

A CONSIDERABLE amount of attention was directed toward the control of weeds in corn, as evidenced by the number of papers presented on this subject. C. H. Dearborn, Geneva, N. Y., described the effect on sweet corn productivity, of four compounds of 2,4-D. His paper stated that neither the chemical used in weeding nor the position from which it was sprayed, produced any significant difference in the yield of sweet corn. It was noted, however, that the sprays applied above the corn either in front or in the rear of the tractor gave a complete kill of weeds sensitive to 2,4-D, even though they stood as high as the corn itself. In contrast, it was pointed out, where the sprays were applied below the corn, or 8 to 12 inches above the ground, only the lateral branches of Lambs quarters, red root and ragweed were killed. The ester killed a higher proportion of the lateral branches but did not as a rule kill the terminal growing point when applied below this region of the plant. Rolling of the corn leaves occurred only where the esters were used. However, the response was not extensive nor serious, he reported.

William H. Lachman, Massachusetts Agri. Exper. Station, Amherst, Mass., reported that pre-emergence application of 2,4-D in corn produced seriously malformed corn plants, and yields were reduced significantly with a 3.0 pound application of 2,4-D. A 400 pound application of granular cyanamid and 5.0 and 10.0 pound applications of "XP-40A" were not effective in controlling weeds. However, sodium pentachlorophenate, dinitro-o-sec-butylphenol and the ammonium salt of dinitro-o-sec-butylphenol proved effective as pre-emergence herbicides. He concluded that this investigation indicated that about 20 pounds of sodium pentachlorophenate applied soon after planting was the most effective treatment under test.

Reports of tests on pre-emergence weed control in corn with cyanamid were presented in a paper by F. B. Muller and T. E. Odland, Kingston, Rhode Island. They found that granular cyanamid applied broadcast as a pre-emergence application of 400 to 600 pounds per acre was effective in controlling weeds for several weeks and in furnishing supplemental nitrogen to the drop. However, one cultivation is necessary to control weeds later in the season, and to aerate the soil which also permits nitrification of the residual cyanamid.

Muller and Odland also presented a paper covering weed control in corn with 2,4-D, over a two-year period. They reported that severe injury to the corn resulted from spraying when the crop was about 4 inches high in 1948, but not in 1949. They stated that the cause of this injury is probably related to soil conditions preceding and following application. Weed control is most effective when applied at pre-emergence or shortly after emergence, since more of the herbicide may be applied and grasses as well as broadleaved plants may be killed. They concluded, however, more research is necessary to determine how soil conditions affect the toxicity of 2,4-D.

Control of weeds in dent corn by use of 2,4-D was discussed in a paper by L. E. Hogue and R. G. Rothgeb, University of Maryland, College Park. After using the amine salt of 2,4-D in 24 fields in 12 counties in 1949, it was found that pre-emergence treatment with or without cultivation gave better control of broad-leaved weeds than did post-emergence treatment. Regardless of cultivation and time of application, two applications were superior to one, they observed. It was also noted that in spite of chemical treatment, all non-cultivated plots were significantly lower in yield than corresponding plots with cultivation. Apparently, cultivation contributed something in addition to weed control. "In general," the paper concluded, " . . . chemical weed control was of practical value and one or possibly two cultivations might be eliminated by its use." Further work is needed for confirmation, however.

New Group Studied

THAT the 3,6-endoxohydrophthalic acids and their salts have "unusually interesting" plant response properties, was brought out in a paper presented by Nathaniel Tischler and Gorgonio P. Quimba of Sharples Chemicals, Inc., and James C. Bates, Kansas State College. They reported that this new group has given excellent and commercially feasible defoliation when applied to the top vegetation of a large number of plants. It has also been shown that defoliation may be induced by injecting aqueous solutions of these compounds into the stem or by immersing exposed rootlets into such solutions.

"Striking" herbicidal properties were also reported when the materials were applied to the top vegetation, when used as a pre-emergent treatment for a number of plants, or when injected. They are also effective at extremely low dosages per acre. Some evidence indicates that

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Food & Drug Hearings Establish

Necessity for Insecticides

by

John D. Conner
Special Counsel for
National Agricultural Chemicals Assn.

THE Food and Drug Administration Hearings to establish tolerances for residues of economic poisons on fruits and vegetables got under way January 17. As previously announced, the opening sessions were in charge of Bernard D. Levinson, presiding officer. Dr. Fred C. Bishopp, assistant chief, Bureau of Entomology and Plant Quarantine, U.S.D.A., was the first witness, representing the U. S. Department of Agriculture. (See Pg. 23 for a summary of his testimony.)

Highlighting the activities of the first week of the Hearings, was testimony establishing the necessity of using insecticides and fungicides in the production of fruits and vegetables. This testimony, together with the supporting publications, photographs, and other data, developed in a detailed manner the insect and plant disease problem with which the grower must contend. It emphasized that if these pests are not controlled, the food supply will be greatly reduced. Also, without control of insects and plant disease, food will be contaminated with the presence of insect fragments, and may be scarred and unpalatable.

The testimony presented data on the use of various chemical compounds to control these insects and plant diseases; information on residues left by these chemicals, and methods to remove such residues. Some compounds may be used for pest control without leaving a residue on or in the edible portion of the fruit or vegetable, the testimony declared.

Following this testimony by representatives of the U. S. Department of Agriculture, witnesses representing state agencies were to appear, beginning on February 13. Statements from this group are expected to outline in detail the particular problems of insects and plant disease in their states. These witnesses were to relate how much injury is caused by these pests, and the probable results of failure to control them by chemical means. Also to be considered were matters of residues, if any, resulting from the use of chemical pesticides. (Toxicity data is not to be considered at this stage of the hearings.)

Following Dr. Bishopp, who stressed the seriousness of the insect damage threat to growers, distributors and consumers, Dr. B. A. Porter, Division of Fruit Insect Investigations, Bureau of Entomology and Plant Quarantine, appeared as a witness. He stated that in the absence of insect control, much of the fruit reaching the market would be unfit for human consumption. Since minor pests quickly become major pests, the grower is confronted with an increase of insect problems and the consequent necessity of finding effective controls. Although many other methods have been tried, insecticides offer the only practical means of controlling insects. The cost is high, but if insecticides were not used, fruit would be of poor quality.

According to Dr. Porter, the worst insect pest of the several hundred attacking apples is the codling moth, found wherever apples are grown. In describing the damage resulting from attacks by some of the several hundred insects, Dr. Porter said that the fruit is not always attacked directly and that the tree is damaged by borers that work under the bark; by scale insects that suck the sap out of the tree and by other insects that eat the leaves or attack the leaves and the fruit. Such pests can make the tree unprofitable or distort or stunt the fruit to such an extent that it is unmarketable. The codling moth attacks the fruit and often produces several worm holes per apple. The fruit frequently falls from the tree, does not stand up in storage or shipment and has no commercial value.

Lead arsenate was practically the only chemical available for codling moth control from 1900 to 1930, and as infestation increased, more frequent applications were required and heavier residues resulted, necessitating washing of the fruit in some areas. The use of lead arsenate is still considered necessary and it is being used in some areas. Other chemicals were tried from time to time and were either ineffective or varied so greatly in the results obtained in various sections of the country that their use was not found practical. DDT is now used generally in all parts of the country and so far there are no indications of codling moth resistance. However, results have not been entirely favorable as DDT is not effective with some pests and does kill some beneficial insects. Leaf roller infestation has been reduced by the use of toxaphene, TDE, parathion and lead arsenate, he said.

Dr. Porter also pointed out that there were other insects causing serious damage to apples. There is no residue problem when lead arsenate is used to control the plum curculio because it is applied early in the season. Irregular results were obtained from the use of DDT on apple maggots but lead arsenate controls this pest very effectively. Aphid control is secured by using nicotine combined

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Practical Control of Water Hyacinth with 2,4-D

Above: Close-up of Bell 47-D type helicopter showing arrangement of nozzles on the 23-foot boom.

by

P. W. Zimmerman, A. E. Hitchcock Henry Kirkpatrick, Jr. and T. T. Earle[1]

Boyce Thompson Institute for Plant Research, Inc.
Yonkers, New York

THE rapid spread of water hyacinth (*Eichhornia crassipes Solms.*) in the southern states, with its adverse effects on agriculture, health, and wild life, and its interference with drainage and navigation, has been an alarming problem for many years. The seriousness of the situation has long been recognized by the U. S. Army Engineers who are in charge of navigable waterways. However, up to 1948, no satisfactory means of chemical control had been developed. In an all-out effort to solve the problem, funds were made available by the U. S. Corps of Engineers[2] for research on control of marine growth by chemical means.

The two main species of weeds clogging the waterways in the Gulf Coastal area are water hyacinth and alligator weed (*Alternanthera philoxeroides* [Mart.] Griseb.). The basic research phase of the investigations involving the evaluation of 2,4-D (2,4-dichlorophenoxyacetic acid) and other chemicals with respect to their effectiveness for controlling hyacinths was concluded the latter part of 1948. Results of these tests indicated that of all the chemicals tested, 2,4-D was the most effective for killing and sinking the water hyacinth as well as being fairly effective on alligator weed which frequently occurs in dense stands together with the hyacinths. The alligator weed is primarily a land plant and does not thrive in water when not anchored in soil. It will spread rapidly from the banks over mats of hyacinths, but with the means at hand to eradicate the hyacinths, the alligator weed becomes of lesser importance.

The purpose of the present report is to summarize the results to date and to furnish recommendations for the eradication or practical control of water hyacinth.

Early Exp. Results

BY 1948 2,4-D was regarded as one of the most satisfactory chemicals for use in controlling weeds in crop and in non-crop areas. Considering the large-scale use of 2,4-D at that time, it is somewhat paradoxical that the use of this chemical for the practical control of water hyacinth had not been demonstrated prior to 1948 in any part of the world where this pest grows. Although many individuals are known to have treated water hyacinths with 2,4-D and other chemicals, there are only a few published reports on the subject, none of which gives substantial information as to how water hyacinth can be effectively controlled with 2,4-D.

In the spring of 1948 experiments were undertaken to determine the most effective chemicals for killing and sinking water hyacinths, and to determine the relative importance of such limiting factors as the formulation of the chemical, concentration, rate of application and delivery, time of year, rate of growth and stage of development of the plants, and the method of applying the chemical. The principal treatments were applied to hyacinths growing in pits located on the Bonnet Carré Spillway property at Norco, La. Each of the 108 experimental pits was approximately 15 x 30 ft. at the top, 10 ft. deep, and 10 x 10 ft. at the bottom.

A sufficient number of mature hyacinths were placed in each pit to cover the surface completely. Growth and appearance of the plants in the pits were similar to those in the waterways from which the original plants were obtained. Sprays were applied to the pits after the plants became

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1 Department of Botany, Tulane University, New Orleans, La.

2 The investigations reported herewith were carried out by members of the staffs of Boyce Thompson Institute for Plant Research, Inc., Yonkers, N. Y.; Tulane University, New Orleans, La.; and the U. S. Corps of Engineers, New Orleans District. The cooperative project was made possible by a contract between Tulane U. and the U. S. Corps of Engineers.

The authors wish to acknowledge cooperation from the District Engineer, New Orleans District, Colonel Charles G. Holle, and staff. Especial thanks are due Colonel John R. Hardin, former District Engineer, and Mr. Walter C. Carey, Special Assistant to the District Engineer, who maintained an active interest throughout and made many helpful suggestions. Thanks are also due Mr. C. R. Dunn and Mr. C. Tomlinson, who gave valuable assistance throughout the project. Acknowledgment is due Dean Fred Cole who made the project possible through the facilities of Tulane University. All photographs were supplied by the Corps of Engineers, U. S. Army, New Orleans District.

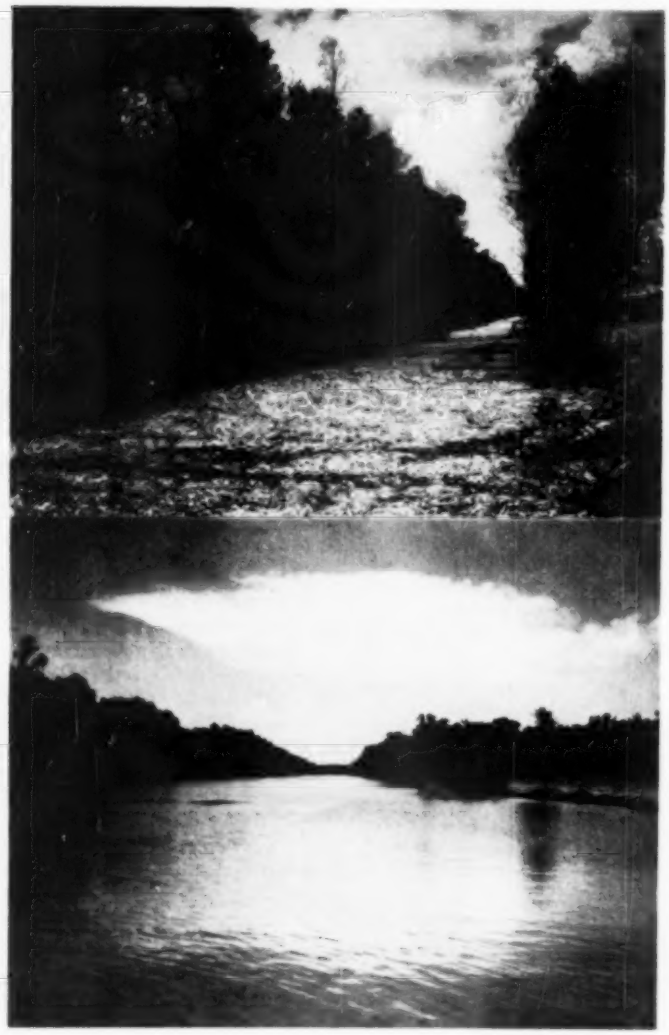
established. Those placed in pits during the maximum growing period (May through June) were ready for treatment in three weeks. Those placed in pits at other times of the year were not ready for treatment for at least two months. The rate of vegetative reproduction and growth is most rapid during the period April through June. Starting in May three plants produced 3000 new plants in 90 days, whereas starting in August three plants produced only 30 new plants in 90 days. Plants in pits responded to a given treatment the same as those growing in the canals and bayous. Each pit contained approximately 10,000 plants, and one acre of an infested waterway contained approximately 800,000 plants.

The low volume low pressure spraying equipment used during 1948 consisted of a four-nozzle boom and hose attached to a gasoline-powered compressor that was connected to a storage tank having a reducing valve. The Spraying Systems nozzles used with this equipment delivered a flat fan-shaped spray ranging in delivery rates from 6 to 150 gal. per acre when operated at pressures of 25 to 30 lb. per square inch. A gun-type sprayer operated at about 400 lb. p.s.i. was also used. Both types of sprayers were used for treating plants in the experimental pits and plants growing in canals and bayous.

Results of the tests carried out in 1948 showed that 2,4-D was more effective for killing and sinking of hyacinths than 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) and more effective at equivalent concentrations than any of the contact types of weed killers used, including arsenicals, chlorates, chlorinated benzenes, chlorinated phenols, ammonium sulfamate, ammonium thiocyanate, sodium trichloroacetate, and one of the dinitrophenols. An effective treatment is considered one which kills all hyacinths and causes them to sink within 60 days after the spray is applied. Killing of all above-water parts of hyacinths is not an indication that all under-water parts have been killed, or that the majority of plants will sink within the 60-day period.

The alkanolamine (Dow Chemical Co.) and triethanolamine salts of 2,4-D were of equal activity when compared on an acid equivalent basis and were as effective for killing and sinking hyacinths as the isopropyl and butyl esters of 2,4-D. All of these formulations of 2,4-D were slightly and consistently more effective than the sodium salt.

There is a prevalent opinion that the isopropyl and butyl esters of 2,4-D and 2,4,5-T are more effective than their corresponding amine salts for killing or controlling weeds. This generalization is based mainly on results obtained with doses of 2,4-D in the range below 4 lb. per acre.



(Top Photo) Fifty-foot wide canal solid with dead hyacinths and lined on each bank with tall overhanging trees. 50 days after treatment with a 40 percent concentrate of 2,4-D applied by helicopter. (Note complete killing from bank to bank, including plants under trees.)

(Lower Photo) Large borrow pit, 300 to 400 ft. wide and approximately four miles long, completely cleared of hyacinths by an amine salt of 2,4-D applied by boat-mounted equipment in April, 1949, and maintained with one patrol maintenance spray two months later. (Photo taken July 28, 1949.)

Water hyacinth constitutes an exception since the alkanolamine and triethanolamine salts of 2,4-D (referred to hereafter as amine salts) were of equivalent effectiveness to the isopropyl and butyl esters for killing and sinking the plants when used at the rate of 8 lb. per acre. Under special conditions lower doses (2 to 4 lb. per acre) proved effective, but the esters and amine salts were still of equal effectiveness. No attempt was made to compare the esters and amine salts of 2,4-D in the range substantially below that which caused effective killing and sinking of hyacinths.

Increasing the dose of 2,4-D from 4 to 16 lb. per acre caused an increase in the number of plants which sank in a given time. When 2,4-D was applied at concentrations of 0.5 to 8.0 per cent and at delivery rates of 18 to 200 gal. per acre, a dose of 8 lb. per acre caused hyacinths to sink within 60 days at all times of the year. Regardless of the quantity of spray solution applied, 0.3 per cent 2,4-D was the approximate minimum concentration which was effective. Applying more than 75 gal. per acre with low pressure equipment or more than 200 gal. per acre with high pressure equipment caused no noticeable increase in killing or sinking of the plants.

Other examples may be cited in which the relative effectiveness of chemicals or of formulations depend upon the dosage range or upon the concentration of the active ingredient in the spray solution. For example, the alkanolamine salts and isopropyl esters of 2,4-D and 2,4,5-T were of equal effectiveness for killing and sinking hyacinths when used in the 8 to 16 lb. per acre range, but in the 2 to 8 lb. per acre range the 2,4-D formulations were more effective than the 2,4,5-T formulations. Furthermore, the amine salt of 2,4,5-T was more effective than the isopropyl ester of 2,4,5-T in the 2 to 8 lb. per acre range.

Even at the same rate of application, differences in formulations of 2,4-D depended upon the concentration of the spray solution. For example, at the 8 lb. per acre rate of application the ester and amine salt formulations of 2,4-D were more effective than the corresponding 2,4,5-T formulations when the concentration of the spray solution was 0.6 per cent or less. These results are to be contrasted with the equal effectiveness of the same formulations at the 8 lb. per acre rate when the concentration of the spray solution was 1.2 per cent or higher. The necessity for using a spreader with commercial preparations of the amine salt of 2,4-D also depended upon the concentration of the spray solution. When an application of 8 lb. of 2,4-D per acre was made by applying this quantity of 2,4-D in 75 gal. or less of water per acre by means of low pressure equipment, the addition of a spreader did not increase the effec-

(Top) Large borrow pit 400 to 500 ft. wide and approximately 3½ miles long, showing a solid, bank to bank infestation of water hyacinths treated four weeks previously (July 19, 1949) with 40 percent 2,4-D concentrate applied by helicopter flown at height of from 8 to 10 feet.

(Lower) Same borrow pit as above, fifty days after application. (Photo taken July 28, 1949.)

tiveness of the treatment as was the case when the same quantity of 2,4-D was applied in 100 or more gal. of water per acre by means of high pressure equipment.

The fastest rate of killing and sinking (within 30 days) occurred during the relatively slow growing period from August through March, even in one instance when the temperature was 32°F. at the time of treatment. From the practical standpoint it is important to know that the hyacinth can be most readily killed at a time when its growth and reproduction by off-shoot formation occur at a relatively slow rate. The few plants which might not be killed by a treatment applied in the fall or winter would not constitute the serious hazard they would if escaping treatment in May or June.

Application Methods

AFTER completion of the basic research conducted mainly on hyacinths in the experimental pits, equipment and methods of applying the chemicals under large-scale field conditions were undertaken. If water hyacinths were to be eradicated or brought under control, it was evident that only a negligible number of plants should remain in any of the treated waterways. This meant that the initial application of 2,4-D should result in practically 100 per cent killing and sinking of hyacinths in order that the subsequent patrol maintenance spraying of a few remaining plants would constitute a minor instead of a major operation. Large-scale use of 2,4-D was started in 1949.

Boat-and truck-mounted spraying equipment. The four-nozzle boom used so effectively for killing hyacinths in the experimental pits was not suitable for use in treating hyacinths where the margins of waterways were irregular and were lined with overhanging branches and fallen trees. However, the four-nozzle boom was used in a few comparative tests in order to determine whether the hyacinths in canals and bayous responded the same to a given treatment as those growing in the experimental pits. As previously mentioned, the results were the same. In most cases large-scale applications of 2,4-D were made with a high pressure gun-type sprayer operated from land or from a boat.

TABLE I

Relative Coverage Obtained with Spraying Systems OC Boomjet Nozzles at Different Rates of Application and Delivery When Operated at a Pressure of 75 Lb. p.s.i. and at a Walking Speed of Three Miles Per Hour. Evaluation is Based on the Killing of All Hyacinths 50 Days After Treatment with an Amine Salt of 2,4-D.

OC Boomjet*	Concn. 2,4-D (%)	Lb. per acre	Width of effective killing (ft.)
150	0.3	2	**
150	0.6	4	25
150	1.2	8	30
80	2.0	9	20
40	3.0	8	15
20	3.0	9	8

*Manufactured by Spraying Systems Company, Bellwood, Ill.
** Not Effective.

TABLE II

Calibration of Helicopter* Spraying Based Upon the Relative Amount of Top Kill on a Mixed Growth of Alligator Weed and Regrowth Willow Shoots. Measurements of Spray Coverage Were Made One Week After Spraying with 40 Per Cent 2,4-D in the Form of an Amine Salt. Speed of Flight Was 30 Miles Per Hour

Spraying height (ft.)	Total width of treated area (ft.)	Total width of area, in feet, showing different degrees of top kill		
		Complete	Partial	None**
10	115	58	24	33
20	175	60	29	86
40	217	114	19	84
80	296	136	110	50

*Bell 47-D equipped with standard Bell-type boom containing, in this case, 84 nozzles.
**Plants in this zone exhibited leaf bending.

Two types of high pressure pumps were tested, namely, the Bean "Junior Duplex" with a 4 g.p.m. (gal. per minute) capacity, and the Bean "Royal 35" with a 35 g.p.m. capacity. Pressures varied from 150 p.s.i. up to 600 p.s.i., with larger tips being used in the spray gun with the greater volume higher pressure pump. At pressures greater than 200 p.s.i. considerable atomization of the spray occurred, which resulted in excessive drift. Effective ranges of the equipment varied from 25 ft. with the smaller pump up to 60 ft. with the larger pump. Uniform coverage was not obtained with gun-type sprays, and forward speed of the spray vehicle was limited by the width of the area being treated. No speeds greater than three miles per hour were possible where widths exceeded 15 ft., and it was difficult to obtain a sharp line of demarcation between treated and non-treated areas. Even with the limitations mentioned, the gun-type sprayer was used successfully in spraying large waterways with 1 per cent 2,4-D at the rate of 150 to 200 gal. per acre.

A new type of off-center spray nozzle, Spraying Systems "OC Boomjet," has a 1-¼ in. pipe connection, operates at pressures of 60 p.s.i. or less, and produces a flat spray which gives uniform and complete coverage (Table 1). The "Boomjet" is considerably more efficient than the gun-type sprayer for attaining uniform coverage of plants. By varying the aperture of the "OC Boomjet" nozzle tips (Nos. 20 to 300), spraying widths varied from 10 to 40 ft. Results obtained with "OC 300" are not included in Table 1. Effective killing and sinking of hyacinths was accomplished by an "OC Boomjet" application of 100 gal. or less per acre of a solution containing 8 lb. of 2,4-D

(*Turn to Page 81*)

Suppliers' Bulletins

Emusifier Information

Monsanto Chemical Co., St. Louis, Mo., has issued a recent 12-page bulletin containing information on four new Monsanto emulsifiers and their uses, and also data on solvents and other ingredients. Instructions for use with chlordane, DDT, 2,4-D, (and its salts), 2,4,5-T, mixtures of the two, aldrin (compound 118) and "Sulfasan" (Xanthogen Disulfide-Monsanto) are given in detail. Write for bulletin P-142, care of the company.

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Equipment Bulletin Out

Buffalo Turbine Agricultural Equipment Co., Inc., Gowanda, N. Y., has issued a comprehensive folder, "Turbine News" presenting pertinent information on the subject of sprayer and duster equipment. The folder, which opens out to 14½ x 16½ inches, is available from the company.

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Soil Fumigant Info.

The Dow Chemical Company Midland, Mich., has announced the availability of a new bulletin on their soil fumigant "W-85." The data in the bulletin are designed to be of value to those interested in improving crop yields in soil infested with nematodes and soil-borne insect pests. Tables and information indicating how soil fumigation costs can be reduced, are included.

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Bulletin Reports Tests

Bulletin E-790 of the U. S. Department of Agriculture, is the sixth of a series of papers reporting tests with 89 compounds not previously reported, and which were tested from January, 1946, to March, 1949. The Division of Insecticide Investigations supplied all samples, the report states. Authors are G. T. Bottger and A. P. Yerington, of the Division of Control Investigations, and S. I. Gertler, Division of Insecticide Investigations. Previous papers (E-621, E-634, E-729, E-738 and E-744) had reported results obtained with approximately 1,200 compounds. Copies may be obtained from the U.S.D.A., Washington 25, D. C.

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New Sprayer Information

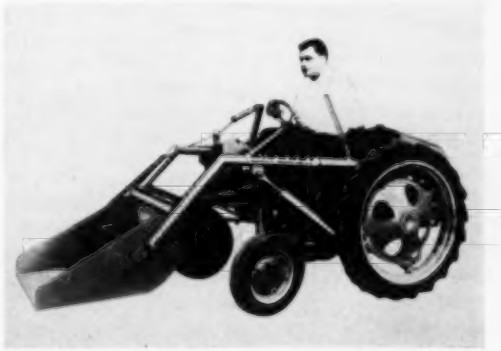
Hanson Chemical & Equipment Co., Beloit, Wisconsin, have released their Brodjet Boom Sprayer for general crop spraying. Originally designed for highway work, the past year has served as a proving period during which many units were utilized in various parts of the United States and Canada for crop spraying. The four foot boom will spray up to a 34 foot swath, the makers state. It is said to eliminate nozzle clogging and the need for long pipes. The company also reports that drift is minimized because of larger droplet size. Units for 17 foot and larger swaths are available. The boom can also be bought separately to add to equipment already in use, the makers state. Write for "Brodjet" booklet, Howard Hanson Chemical & Equipment Co., Beloit, Wisc.

•

Offers New Rig Cleaner

Harang Engineering Co., San Francisco, has introduced a new detergent for flushing and cleaning agricultural spray rigs. Marketing the material under the trade name of "Nutra-Sol," the makers state that the product has a two-fold action; first neutralizing and removing all previously-used chemicals, then removing from the tank, hose and boom, the dirt, scale, rust and sediment which cause difficulty in efficient spraying operations. Literature on the product is available from the company, 840 Lake St., San Francisco 18, California.

Maquoketa Announces New Loader and Stacker



The Maquoketa Co., Maquoketa, Iowa, has announced a new loader and stacker for use in fertilizer plants. According to its makers, the machine is versatile and portable, being small enough to be transported in a truck to various locations. It has a 63-inch turning radius, and is powered by a 9.04 hp 4 cylinder motor. It can lift a load of 1000 pounds. Height of the lift can be adapted to suit indivdual specification. Hydraulic power comes from a pump driven directly off crankshaft. Further information is available from the company.

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Technical Briefs

Parasite Control on Sheep

Infestation of sheep by ked (*Melophagus ovinus*) was somewhat better controlled by 110 grams of one per cent rotenone dust per animal applied before shearing, than by a similar application of benzene hexachloride, in that reinfestation by emergences from pupae was more effectively prevented. Both treatments controlled lice completely. Other sheep were dusted after shearing and slaughtered 10, 14, or 30 days afterward. Organoleptic tests of roasts made from the carcasses by a standard procedure showed no differences in flavor that could be attributed to the insecticidal treatment. R. J. Dicke, A. L. Pope, R. W. Bray, and F. Hanning, *J. Agr. Research* 78, 565-9 (1949).

•

Glads Well Protected

Gladiolus flowers treated with a series of insecticides as dusts in concentration of 5% DDT; 1% benzenehexachloride; 5% parathions; and 5% toxaphene resulted in 85 to 95% flowers free from the *Taeniothrips simplex*. A concentration of 10% DDT resulted in 53% thrips-free flowers, and DDT aerosol produced 96% thrips-free flowers.

The application of these insecticides as sprays in the following concentrations produced 86% thrips-free flowers: (contents per 100 gallons) DDT, chlordane and toxaphene in emulsions containing .5 pound, benzene hexachloride emulsion of .1 pound. Sprays of tartar emetic or hexaethyl tetraphosphate yielded 75 to 85% thrips-free flowers. *J. Econ. Entomol.* 41, 955-9, (1948).

•

Efficient Fertilizer Use

More efficient use of fertilizer is resulting in higher yields and greater net income returns to farmers. A prime contributor to this increased efficiency is the testing of soils on individual farms through soil-testing laboratories.

Interest in soil testing is increasing and this service is being expanded in a number of States. In Illinois, for instance, 10 new county soil-testing laboratories were started during the first half of this year. As of July 1, 76 county laboratories were serving 83 counties. The remaining counties test for acidity and phosphorus and send the soil samples to the university laboratory or to an adjoining county for the potash test.

Last year in Illinois, with 68 laboratories in operation, one million acres were tested. With the additional facilities available it is expected that between one and a half million and two million acres will be tested this year.

—"PLANT FOOD JOURNAL" (*American Plant Food Council, Wash., D.C.*)

Report Made on Plant Growth Inhibitor

By J. E. Knott
University of California

THE rapid growth of Pyracantha, especially during the spring and summer month, necessitates frequent clipping when it is planted as a hedge. Schoene and Hoffman (1949) have reported the growth inhibiting effect of maleic hydrazide when applied to tomato plants, certain grasses and weeds. The length of the inhibition of growth seemed to be proportional to the concentration used. It appeared that this material might be effective in controlling the growth of shrubbery.

A *Pyracantha crenulata* Roem. hedge 96 feet long, 2½ feet wide, and about 6½ feet high was available for experimentation. It had customarily been clipped about every three or four weeks from April to November in order to maintain the flat top and vertical sides. This method of pruning gave little opportunity for flower or berry development. The hedge was divided into sections for the experiments discussed below. The aqueous solutions were prepared from a 30 per cent (by weight) solution of maleic hydrazide in a water-diethanolamine mixture, as supplied by Naugatuck Chemical Co. No spreading agent was used. To delay evaporation, the solutions were sprayed on the foliage at dusk with a hand atomizer. The parts of the hedge adjacent to that being sprayed were covered with paper to prevent any contamination from drift of the mist.

On April 7, 1949, immediately after clipping, the foliage on the top and south side of a 3-foot linear section was sprayed with a 0.1 per cent solution of maleic hydrazide atomized on the leaves at the rate of 30 cc per square foot. This concentration and rate of application had no retarding effect on growth.

The hedge was clipped again on May 5, and the top and south side surfaces of another 3-foot linear section were atomized with a 0.5 per cent solution of maleic hydrazide at the rate of 20 cc per square foot. By June 5, there was no sign of new growth on the treated area, although there were a few shoots 8 to 10 inches high and many shoots 4 to 5 inches high on the check. No discoloration or injury to the leaves or berries resulted from the maleic hydrazide application.

The remainder of the hedge except for the check and treated plot was clipped June 6. The growth on July 6 on the treated section, the check, and the clipped part are shown in figure 1. At this date the check section had a mass of shoots 15 to 18 inches high, while most of the shoots on the part receiving the 0.5 per cent solution of maleic hydrazide were just starting growth, although a very few were 5 to 6 inches high. The clipped section had produced a solid mass of new growth 5 to 6 inches in height.

On June 5 another part of the hedge, newly clipped, was divided into five 3-foot linear sections. One was left untreated, while the others were atomized with solutions containing 0.2, 0.3, 0.4, or 0.5 per cent of maleic hydrazide, respectively. This

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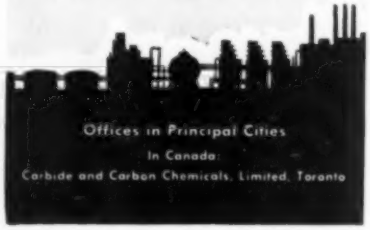

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was applied to the top and south side surfaces at rate of 15 cc per square foot.

Two months later the unsprayed section had an average 42.4 shoots per square foot with a length of 9 to 12 inches. The part receiving the 0.5 per cent solution of maleic hydrazide had an average of only 1.3 shoots per square foot, and those were but 1½ to 2½ inches in length. The hedge in the section atomized with 0.4 per cent solution had twice as many shoots. These were 3½ to 4 inches in length. The shoot growth in the section treated with 0.3 per cent solution of maleic hydrazide averaged 3.0 per square foot with lengths of 4 to 5 inches. That which received the 0.2 per cent solution of maleic hydrazide averaged 3.6 shoots per square foot, most of which were 4 to 5 inches long. All sections except those receiving 0.4 per cent or 0.5 per cent of maleic hydrazide had many short shoots just starting.

On July 10, two 25 foot sections were sprayed after clipping. These received 5 cc per square foot of 0.5 per cent maleic hydrazide solution on the top and south side surfaces. Two months later these showed in general a fair inhibition of growth. The untreated portion of the hedge had a heavy growth of shoots of various lengths, with an average of 5.1 shoots 6 to 12 inches tall per square foot. Scattered shoots of that length appeared in the two treated sections. These averaged 0.61 and 0.65 such shoots per square foot. Most of these shoots originated several inches below the surface. It was evident that the rate of application, 5 cc per square foot, was not sufficient to reach all growing points, especially if the tip of a branch were protected from the spray by a leaf or shoot cut off in the clipping.

The whole hedge was closely clipped September 12. No maleic hydrazide was applied. New growth developed rapidly on the previously untreated portions, making them stand out prominently a month later. The maleic hydrazide applied on July 10 was still slowing down growth effectively but not inhibiting it.

Plant Growth Inhibitor's Action Demonstrated

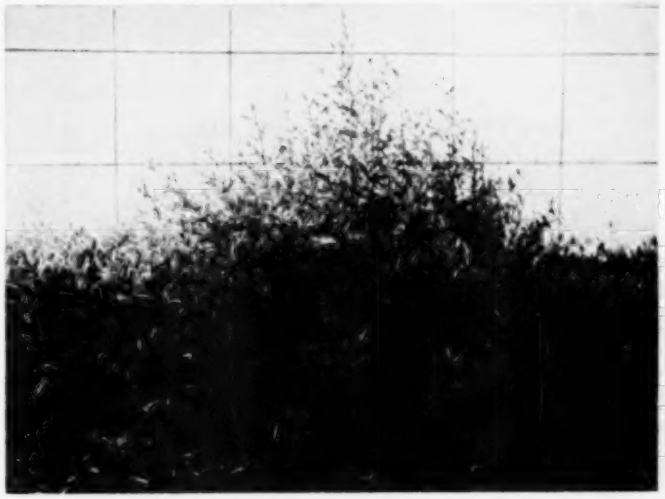

Fig. 1. Unsprayed section of hedge in center. Part of the area receiving 0.5 per cent of maleic hydrazide on May 5 is seen on the right. On the left is the growth which developed after clipping on June 6. Photographed July 6.

Summary

The necessity for frequent clipping of a *Pyracantha crenulata* hedge was reduced greatly by spraying the hedge, after clipping, with a solution containing 0.5 per cent of maleic hydrazide, applied at a rate which moistened well the tops of the clipped stems. This required about 15 to 30 cc (½ to 1 fluid ounce) per square foot. New shoot growth was checked completely for at least a month and retarded greatly for a month or more after that. No injury to the evergreen foliage or to any partly developed berries was apparent.

Literature Cited

1. Schone, D. L., and Hoffman, O. L. Maleic hydrazide, a unique growth regulant. Science 109: 588-590. 1949.

•

DDT and Seed Germination

Evidence that the purified form of DDT does not affect germination of seed comes from a study made by H. T. Hopkins, soil scientist, and Dr. E. H. Toole, plant scientist, of the U.S. Department of Agriculture. The investigations are a part of research to explore the effects of this insecticide on all phases of plant growth.

The purified form of DDT did not affect the initial stages of germination of cucumber, rye, squash, or lima bean seed planted flat on special crepe paper impregnated with a large amount of the compound. It did, however, affect lima bean seed planted with the hilum (eye) down. Some of the seed disintegrated before germination was completed.

Technical DDT, which is the form used in commercial insecticide preparations, reduced significantly the percentage of germination of rye and squash seed and of lima bean seed planted with the hilum down. Cause of this is believed to be some component in the formulation other than DDT.

After germination had started, the early growth of lima bean, cucumber, and rye seedlings were profoundly affected by high concentrations of technical DDT, the study shows. This confirms previous results showing DDT injury to seedlings of certain crop plants.

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The Listening Post

New Plant Diseases Pose Added Control Problems

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

ONION smut, caused by the fungus *Urocystis cepulae*, is reported only occasionally outside of northern onion-growing sections, where it would be destructive without the effective measures that have been developed to control it.

Apparently the disease had not been reported in California before 1949. James B. Kendrick of the University of California and E. E. Stevenson, Farm Advisor for Stanislaus County report that it was found in a two-acre onion plant bed in October. Careful examination of the affected bed on October 12 showed the disease to be generally distributed over the entire two acres, although more severe in certain localized areas. According to the grower, this plot of land had been used as an onion plant bed for the past eight years in succession. The wide distribution and severity of the disease in many localized areas left little doubt that the disease had been in the soil for some time. The planting is in a light sandy soil.

Seed of the Stockton Red and Stockton Yellow varieties were planted on beds in this field on August 25 of this year. It was evident that many of the seedling plants were killed by the disease, but there was no appreciable reduction in stand. Many plants showed heavy infection on the outer leaves and older leaf scales. The percentage of diseased plants varied from 4 to 55, with an average of 16 percent. The disease was considerably more severe in that portion of the field planted to the Stockton Yellow variety than in the area planted with Stockton Red.

Since the grower stated that he had, in previous years, sold plants from this nursery in the adjoining county of San Joaquin, five plantings of comparable age in the French Camp section of San Joaquin, County were examined, and no evidence of smut was found. On October 14 the California State Department of Agriculture reported that three out of four onion plant beds examined in another district of San Joaquin County showed from a trace to considerable smut. A further survey is being conducted by the State Department to determine the extent and distribution of onion smut in the State.

Pathologists working with onion smut have given considerable attention to soil and air temperatures in relation to infection, severity, and occurrence of the disease. It has been shown that a high percentage of plants grown on smutted soil became infected at low soil temperatures, but at higher temperatures infection was reduced, and complete freedom from the disease occurred at 84°F; high air temperature alone failed to check the development of the disease. It has been shown that the period of susceptibility of the onion plant to smut infection usually extends from the time the seed germinates until the cotyledon attains full growth, a period of about three weeks. The fact that onion smut is not a factor in the winter commercial onion growing sections in the South and in one or more sections in the Pacific Coast States is attributed to climatic factors.

It has been assumed that the relatively high temperature prevailing in interior California during August and September, when normally most commercial onion seed is planted, prevents the occurrence of onion smut. While it is true that the daytime temperatures in the San Joaquin Valley of California are relatively high, it is also true that the night temperatures are relatively low. The maximum mean temperature for August and September is only slightly above the maximum for smut infection, and the minimum mean, as well as the average mean, is well within the range for abundant infection.

Under California conditions, onion plant beds are kept relatively wet from seeding until the plants are well above the soil. It is quite likely that the mean soil temperature in the surface soil is lower than the mean air temperature, owing to rapid evaporation. It is evident that the daily mean temperatures are not sufficiently high to exclude smut infection where it is present in the soil.

A Court Noué-like Disease in California Grape Vines

A VIRUS disease of grape vines called "Court noué" (short node), is very important and widespread in European vineyards. Wm. B. Hewitt and A. J. Winkler of the University of California report that a very similar condition has recently been discovered in California.

Some severely dwarfed grape vines with malformed leaves were first called to their attention in the spring of 1948. These were five-year old vines of the variety Pinot Chardonnay (Citis *vinifera*) on St. George (*Rupestris St. George*) root stock. New growth on about 4 percent of the vines in the vineyard was dwarfed and many of the shoots were abnormally branched. The shoot nodes were close together and some of

them had one or two extra buds. Leaves on these vines were much smaller than normal with various degrees of malformation. The petiolar sinuses of the leaves, which are normally in Pinot Chardonnay, were spread out and the margins straightened; in some instances the angle was over 200 degress. The five main veins of these leaves were gathered toward the midrib. Clusters in most cases failed to set much fruit. They were straggly and contained many shot berries.

By midsummer the diseased vines were growing fairly vigorously. The new growth became more nearly normal as the season advanced, and by September it was difficult, except by careful examination of the older foliage, to distinguish diseased from healthy vines.

This young vineyard located in Santa Clara County, California, was propagated by budding, and the wood came from vines over 65 years old which have since been removed. The exact source of the original Pinot Chardonnay stock has not been determined; however, the evidence indicated that it was imported from France.

Root stocks were propagated from old St. George vines scattered through various vineyards. These vines developed from root stocks previously grafted to varieties that had failed or been destroyed in some way. It was not possible to trace the source of all of the St. George propagating stock used for the planting.

During the 1949 season the same Pinot Chardonnay vines developed symptoms similar to those which had shown the previous growing season, but they were not as severe. A very similar disease was observed in some young Cabernet vines in an adjoining vineyard. The disease was also observed on some six-year old Cabernet vines in a vineyard in Napa Valley.

Since the early spring of 1948, a disease which has developed in a manner very similar to that of the Pinot Chardonnay and Cabernet has been observed on French Colombard vines in the Napa valley.

All three varieties showed the early season dwarfing, node deformity, shoot branching, leaf abnormalities, flower shelling, and apparent recovery during mid and late season. The symptoms resemble very nearly those of Court noue. Tests designed to determine the possible cause of the disease in California have not yet been completed, but because of the importance of Court noue in European vineyards it is desirable to record its apparent presence in California.

Rhizoctonia Crater Rot in Illinois-grown Carrots

G. E. RAMSEY and M. A. Smith of the U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering report the occurence of crater rot, caused by the fungus *Rhizoctonia carotae*, in epidemic form in carrots grown in Cook County, Illinois in 1948. Previously the disease had not been reported outside of New York, where it has been known since 1934.

A large soup company in Chicago stored about 22 million pounds of these 1948-crop Illinois carrots in various cold storages for processing during the winter and spring months of 1948-49. The carrots removed from storage toward the latter part of February began to show small amounts of this decay, and during all of March the loss varied from 5 to 90 percent in different lots. Loss was most severe in toplayer baskets stored in a very humid room. In this room the baskets were wet and many of them were completely covered with the white, cottony mycelium of the fungus. The carrots within these baskets showed up to practically 100 percent infection by this organism. The brown craters ranged from ¼ to 1 inch in diameter and from ⅛ to ½ inch deep. Most of these lesions showed white to cream-colored mycelium on their surfaces.

The soup company reported that their loss on account of this disease would be well over $100,000. Large numbers of the baskets were so badly decayed that it was not feasible to process any of the carrots. In addition to the total loss of many baskets of carrots, the cost of processing the moderately affected roots was considerable. It was estimated that the extra labor cost for peeling and paring out the decayed spots, which had to be done by hand, amounted to about $5000 per week.

Downy Mildew on Beets

CHARLES Chupp and L. A. Alvarez-Garcia of Cornell University report that a greenhouse crop of beets was almost destroyed by a seed-borne disease that apparently was downy mildew, caused by the fungus *Peronospora schachtii*. The seed used in planting the crop originated on the West Coast. Examination of the seed showed an abundance of bodies resembling the oospores of the fungus, but at the time of the report the writers had not been successful in germinating these spores. They state that until the spores can be germinated or further infection obtained in the greenhouse, evidence is not complete that this is actually the fungus causing the damage. However, from the facts that downy mildew has been reported on beet seeds in California, and that the disease was said to be particularly severe in the greenhouse where it occurred, they conclude that oospores of the fungus probably are carried in large numbers with beet seed, and that when conditions are favorable for the fungus the disease can do serious damage in the seed bed. Beet downy mildew has never been reported in the field in New York State.

Alternaria Blight of Carrots Appears in New Mexico

PHILIP J. Leyendecker, Jr., of the New Mexico Agricultural Experiment Station, states that bunching carrots have been grown as a commercial irrigated crop in New Mexico for almost 10 years. Imperator is the variety predominantly planted.

In 1949 the first major outbreak of *Alternaria* blight, caused by the fungus *Alternaria dauci*, to be reported in New Mexico took place.

The Work Horse in the packaging field

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Seven Bemis Multiwall Plants are ready to team up to give you service in an emergency or to provide a dependable source of supply.

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One thousand to twelve hundred acres were damaged at Bluewater and Grants, the major carrot-producing area in the State. Approximately 200 acres were also damaged at Los Lunas, New Mexico, which is rapidly expanding its acreage devoted to carrot production.

In most fields where the carrots were ready for harvest, the older leaves were completely destroyed, leaving only two or three young leaves on mature roots. Packers estimated a loss of from 60 to 70 cents a crate because of increased harvesting costs and a 15 percent reduction in U. S. grade of the tops. The leaves in many fields were severely spotted and necrotic with large lesions on the petioles. *Alternaria* was

(*Turn to Page* 89)

Year End Insect Outlook Reviewed

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Dr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

INSECTS infesting beans as 1949 drew to a close included the bean leafroller, the lesser cornstalk borer, the banded cucumber beetle, the potato leafhopper, and the serpentine leaf miner, all reported from Florida. The cabbage looper was reported to be causing injury to beans in the lower Rio Grande Valley of Texas, and a heavy infestation of the serpentine leaf miner was reported on string beans in southern California.

Cabbage caterpillar populations were moderate to heavy during December on cabbage and related crops in parts of South Carolina, Florida, and Texas, but were considerably lighter in other southern States from which reports were received. The vegetable weevil continued to be destructively abundant on mustard and turnips in Louisiana and was also reported causing some damage to crucifers in South Carolina, Georgia, Florida, and Alabama. Moderate to heavy infestations of aphids were present on cole crops in parts of South Carolina, Georgia, Florida, Alabama, and Louisiana. Lighter populations of aphids infested these crops in Virginia, Texas, and southern California. Other insects reported attacking crucifers during December included the banded cucumber beetle and southern green stink bug in Georgia and Florida, the serpentine leaf miner in Florida, and root aphids which seriously injured cabbage seedlings in Louisiana.

Lygus bugs caused serious damage to lettuce and carrots in South Carolina throughout December. In Florida wireworms injured newly set tomato plants and potato seed pieces, and cutworms damaged tomato and strawberry. Infestations of the southern armyworm were quite severe in tomato fields in the Bradenton section of that State toward the end of December. The tomato russet mite injured late tomatoes in southern California and a heavy infestation of the two-spotted spider mite occurred on fall celery in that area. In the lower Rio Grande Valley of Texas a severe infestation of that mite occurred on eggplant, the cabbage looper and cutworms injured lettuce, the pepper weevil and serpentine leaf miner were very destructive on pepper, and the onion thrips was serious on onions.

Aphids were reported in relatively light infestations during December on spinach in Virginia, on celery, eggplant, and pepper in Florida, and on late peas in southern California.

1949 Greenbug Outbreak

A REPORT on the 1949 greenbug in the United States and Canada has been compiled by the Division of Cereal and Forage Insect Investigations of the Bureau of Entomology and Plant Quarantine from information furnished by various workers in the infested areas. This summary shows that the greenbug which appeared in unusual numbers during June and early July of 1949 in the north-central United States and southern Manitoba and Saskatchewan, Canada, reached severe outbreak status and caused serious economic injury to late-sown wheat, oats, and barley in some parts of the area. The most serious widespread infestation apparently occurred over the eastern two-thirds of North Dakota, the eastern half of South Dakota, the western half of Minnesota, part of southwestern Manitoba, and a narrow strip nearly 100 miles long in southeastern Saskatchewan. Other states infested included Wisconsin, Iowa, Nebraska, Kansas, Oklahoma, and Wyoming. The outbreak caused damage amounting to several millions of dollars.

Insecticide applications were applied against the greenbug in a number of the more heavily infested areas. Some 60,000 acres of small grains, only a small portion of the total area needing protection, were sprayed, mostly from the air. The treatments were more or less experimental and in many instances were applied too late for satisfactory results. The best kills were apparently obtained with sprays of parathion or tetraethyl pyrophosphate. Other materials tried included nicotine sulfate, toxaphene, benzene hexachloride, chlordane, and DDT. The summary concludes that observations of the 1949 and previous outbreaks of the greenbug indicate the necessity for recognizing potentially dangerous populations early so that control measures may be applied in time to prevent serious losses. The report was issued in December 1949 as a Special Supplement (1949, No. 9) to the Insect Pest Survey.

INDUSTRY NEWS

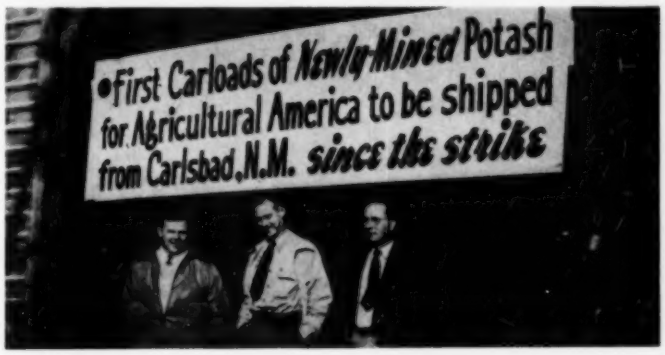
Potash Strike Ends

The strike which affected the production of three major potash producers in the Carlsbad, N. M. area since November 19, was ended on February 1 by the signing of a new contract. The 73-day shutdown began when Local 415 of the International Union of Mine, Mill and Smelter Workers (CIO) struck for an increase of 25c per hour in pay. The three companies involved; Potash Company of America, International Minerals & Chemical Corp., and United States Potash Co., cancelled union contracts when the workers struck. The National Labor Relations Board was unable to enter the picture until December 8, the union having delayed in making anti-communist affidavits required under the Labor-Management Act of 1947.

Progress was slow, even after the entry of the N.L.R.B., since mass picketing operations delayed proceedings until an injunction was secured from a Federal Court in Albuquerque, N. M. to restrain pickets from blockading mine entrances. Due to the critical need for potash with the planting season but a few weeks away, it was decided to reopen the mines, once mass picketing had been prohibited. This was done, with many of the strikers returning to their jobs and some new men being hired.

The new contract, according to company spokesmen, is virtually the same as the former one, with no wage increases, pension, insurance, nor vacation changes. The new pact will be effective until May 31, 1950, which is the time when the old contract would have expired.

Leaders in the fertilizer industry, although recognizing the losses of potash during the past 2½ months, were not entirely pessimistic about the situation. Clifton A. Woodrum, president of the American Plant Food Council, Washington, said that "although irreparable losses of potash have resulted . . . . the serious effect on the fertilizer supply this year will be lessened if farmers will take fertilizer deliveries as soon as offered to permit full utilization of industry production facilities. "He said that fertilizer manufacturers will do all possible to provide fertilizers, but added that " some dislocations in supply will be inevitable as a result of the strike losses."



Despite the strike which began in November, halting production at three Carlsbad, N. M., potash mines, 9 carloads of the mineral left Carlsbad on January 17 to be processed into fertilizer.

On hand to see the cars leave Carlsbad over the Santa Fe rails, were plant managers of the three companies involved in the strike: (L to R) P. S. Dunn, Potash Company of America, Nelson White, International Minerals and Chemical Corp., and Henry H. Bruhn, U. S. Potash Co.

MEETINGS

12th Annual Kansas State Weed Conference, Topeka, February 15 and 16.

Midwestern Shade Tree Conference, La Salle Hotel, Chicago, February 15-17.

Kansas State Weed Control Conference Topeka, Kan., February 15 & 16.

American Mosquito Control Association, Cavalier Hotel, Virginia Beach, Va., February 23 & 24.

N. J. Mosquito Control Ass'n., Atlantic City, N. J., March 1-3.

North Central Branch, A.A.E.E., President Hotel, Kansas City, Mo., March 23 & 24.

10th Annual Southern Shade Tree Conference, Wilson,N. Carolina, March 23-25.

National Fertilizer Association — Greenbrier Hotel, White Sulphur Springs, W. Va., June 12-14.

Pacific Slope Branch, A.A.E.E., Hotel Casa del Rey, Santa Cruz, Calif., June 14, 15 & 16, 1950.

American Plant Food Council, The Homestead, Hot Springs, Va., June 29-30, July 1 & 2.

Decision Favors Velsicol

The Supreme Court of Illinois on January 18, handed down its decision on the suit between Velsicol Corporation, Chicago, and Julius Hyman, head of the company bearing his name, in Denver, Colorado. The decision upholds a decree issued by the Superior Court of Cook County (Chicago), Illinois, on May 27, 1948, ordering the assignment of patent applications covering the insecticidal product, chlordane, to Velsicol Corporation. It also enjoined Dr. Hyman from using, revealing, or assigning these applications or any other process, formulas or products discovered by him or learned by him during his employment with Velsicol Corporation.

Spokesmen for Julius Hyman Company state that the company has applied for a petition for rehearing, and the court is understood to have stayed its action pending its decision on the rehearing.

N W Veg. Insect Conference

The ninth annual meeting of the Northwest Vegetable Insect Conference was held in the Imperial Hotel, Portland, Oregon, on January 3, 4, and 5, 1950. This is a conference of State, Federal and Dominion entomologists engaged in research or extension work on insects of vegetable crops in Idaho, Oregon, Montana, Utah, Washington and British Columbia.

T. A. Bundley, who was chairman of the conference for 1950, was unable to attend. Robert Every, co-chairman, acted as chairman and J. R. Douglass acted as co-chairman. The conference was handled on a panel basis. January 3 and 4 were closed sessions and January 5 was an open session to which members of industry were invited. On January 3, research on insects and pests of the following vegetables was presented: Potatoes, (Loyd Stitt, discussion leader); Soil Arthropods (M. C. Lane, discussion leader); Crucifers, Carrots, Lettuce, Corn, Celery and Onions (H. H. Crowell, discussion leader). On January 4 the insects of the following crops were discussed: Beets, Tomatoes, Beans, and Hops (E. C. Klostermeyer, discussion leader); Pea Insects (Paul Eide, discussion leader); Small fruits, Berries and Ornamentals (R. G. Rosenstiel, discussion leader).

On the evening of January 4, an entomologists dinner was held with Dr. M. C. Mote as toastmaster. M. P. Jones, extension entomologist, U.S.D.A. discussed the hearings on tolerances for poisonous or deleterious substances on or in fresh fruits and vegetables. H. M. Armitage, entomologist, California State Department of Agriculture and chairman of the Pacific Slope Branch, American Association of Economic Entomologists, discussed the meeting of the Association in Tampa, Florida and the coming meeting of the Pacific Slope Branch. A. F. Kirpatrick, entomologist, American Cyanamid Company gave an illustrated talk on the proper method of handling parathion.

On the morning of January 5, the discussion leaders of the conference presented their reports to members of industry at the open session of the conference. Recommendations were made for the control of pea weevil and pea aphids.

The executive committee for the 1950 conference included. T. A. Bundley, Bureau of Entomology and Plant Quarantine, Moscow, Idaho, chairman; Robert Every, extension entomologist, Oregon State College, Corvallis, Ore., co-chairman; and David H. Brannon, extension entomologist, State College of Washington, Pullman, Wash., sec-treas.

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Burgess to USDA Post

Emory D. Burgess, U.S.D.A. entomologist, has been appointed assistant to Dr. W. L. Popham, assistant chief of the Bureau of Entomology and Plant Quarantine, according to Dr. P. N. Annand, Bureau chief. Mr. Burgess will participate in the direction and development of the operations carried on by the Bureau in cooperation with State and local agencies to eradicate or control outbreaks of insect pests and plant diseases.

These include control programs against such insect pests as grasshoppers, Mormon cricket, gypsy moth, white-fringed beetles, Japanese beetle, Mexican fruit fly, and pink bollworm, and plant diseases such as white pine blister rust, black stem rust of wheat and other small grains, phony peach, and peach mosiac.

Mr. Burgess has been associated with the U.S.D.A. intermittently since 1924.

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Advanced by Cyanamid

Charles L. Morris, Jr., has been appointed Assistant Director of the Technical and Plant Personnel Division at the Stamford Research Laboratories of the American Cyanamid Company.

Form S. West Sprayer & Chemical Co.

DR. H. A. WATERS

DR. C. M. MEADOWS

The Southwest Sprayer and Chemical Co. has been organized at Waco, Texas, by two entomologists, Dr. H. A. Waters and C. M. Meadows. The new firm will specialize in cotton insect control with emphasis on spray applications and early season control measures. Spray concentrate formulations and dust blends for control of insects on cotton and other crops will be marketed.

In addition, the firm has been appointed Texas sales office for Spraying Systems Company, makers of spray nozzles; and for the "Yellow Devil" sprayer in the cotton belt.

Associated with the company will be H. E. Meadows and J. E. Smith, both entomogists formerly connected with Sherwin-Williams Company, as were the firm's proprietors, Dr. Waters and Dr. Meadows.

Baughman

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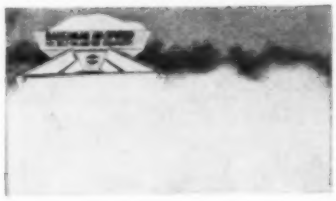

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Baughman's new principle (above) contrasts sharply with the ordinary method (left). The direction control of Model 235 Attachment assures minimum waste in spreading expensive fertilizers.

For Baughman K and K-2 Bodies. Prevents wind from scattering lime and phosphate spreads. Confines air blast from whirling distributor and directs spreading materials outward and groundward. Causes the spread to LAY and STICK. Spreads limestone up to 30 feet . . . phosphate and other fertilizers up to 20 feet.

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SCREW CONVEYOR . . . loads and unloads cars and trucks up to 40 bu. per min. From horizontal to 50° angle. With or without wheels.

BELT and BUCKET ELEVATOR . . . stores in bulk . . . delivers in bulk . . . eliminates bagging. The most efficient way to handle commercial fertilizers.

SECTIONAL STEEL SILO . . . the latest development! By adding or removing sections, it can be adjusted to meet your requirements at little cost.

BAUGHMAN

BAUGHMAN MANUFACTURING CO., INC.
121 Shipman Rd., Jerseyville, Ill.

John Hall Joins Potash Co.

Potash Company of America announces the addition of John W. Hall to its sales staff in the capacity of Northern regional sales manager. Mr. Hall comes to Potash Company of America from the Werthan Bag Company of Nashville, Tenn. which company he has served for a number of years, as eastern sales manager, with headquarters in New York. His headquarters with the Potash Company of America will be at 50 Broadway, New York.

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Fertilizer Export Continues

A continuation of "open-end" licensing provisions for exports of eight nitrogenous fertilizer materials and five nitrogenous industrial chemicals during the remainder of the fiscal year ending June 30, 1950, was announced January 13th by the Office of International Trade, U. S. Department of Commerce. The action continuing non-quantitative quotas for these commodities is based on improved domestic supplies and reduced export demand because of dollar shortages and increased production of the materials abroad, OIT officials said.

Western Weed Conference Held in Denver

THE program for the Western Weed Conference, which was to be held January 30, 31, and February 1 at the Cosmopolitan Hotel, Denver, Colo., was announced at press time. The first day's program was to include a talk by Dr. K. S. Quisenberry, Division of Cereal Crops and Diseases, Bureau of Plant Industry, Soils and Agricultural Engineering, Beltsville, Md., on the national weed control problem and present developments. A panel on weed control on Federal lands was to be included also. Chairman of this portion of the program was listed as Robert Balcom, Bureau of Reclamation, Washington, D. C. Representatives of the Departments of Interior and Agriculture and the army and navy were to appear on this panel.

The second day's morning program was to center about the commercial exhibits at the meeting, under the chairmanship of F. L. Timmons, U.S.D.A., Logan, Utah. Subjects to be discussed were "Types of Spraying Equipment and the Importance of Good Equipment," by John Maletic, Denver, Colo, and the "Use of Aircraft in the Application of Agricultural Chemicals" by Arthur Geiser, U.S.D.A., Denver.

The annual banquet was slated for Tuesday evening, with Walter S. Ball, W.W.C.C. secretary as toastmaster. Eugene W. Whitman, conference president, was to preside at the banquet meeting

Thursday's session was to feature the work of the research section, under the chairmanship of Lowell W. Rasmussen, Washington State College, Pullman, Washington.

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New Phelps-Dodge S.M.

C. H. WINSHIP, JR.

C. H. Winship, Jr. (above) has been appointed Sales Manager for Phelps Dodge Corporation and Phelps Dodge Refining Corporation to succeed Mr. Martin H. Crego, who retired after fifty seven years of service.

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Southern Weed Meeting

The third annual meeting of the Southern Weed Conference was to be held at the Buena Vista Hotel, Biloxi, Mississippi, February 7 and 8, 1950, immediately preceding the meeting of the Association of Southern Agricultural Workers at the same place on February 9-11.

Speakers from many parts of the South were to present papers at the weed conference. These included R. L. Lovvorn, Division of Weed Investigations, Plant Industry Station, Beltsville, Md.; T. C. Ryker, E. I. du Pont de Nemours & Co.,

Photocourtesy American Plant Food Council

Members (above) of the Executive Committee of the American Plant Food Council meeting in Washington January 26, announced that the Fifth Annual Convention of the organization will be held at The Homestead, Hot Springs, Virginia, June 29-30, July 1-2, 1950.

Members of the Committee shown, left to right, are: (back row) Fred J. Woods, Vice President, Gulf Fertilizer Co., Tampa, Fla., ex officio; J. A. Howell, President, Virginia-Carolina Chemical Corp., Richmond, Va., Chairman; W. T. Wright, Vice President, F. S. Royster Guano Co., Norfolk, Va. (Front row) Paul Speer, Vice President, U. S. Potash Co., New York, N. Y.; R. C. Simms, President, Naco Fertilizer Co., New York, N. Y.; A. F. Reed, Vice President, Lion Oil Co., El Dorado, Ark.

Nationally - known educators and leaders in the fields of agricultural research and education will speak at the convention. A high light will be the presentation of awards to the six national winners in the 1950 essay contest jointly sponsored by the Council and the National Grange on "Soil Fertility and the Nation's Future."

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LION Anhydrous Ammonia

Use of this material for direct application to the soil has been proved to be both economical and highly efficient in crop production. Accurate chemical control throughout the process of manufacture assures uniformity and high quality in this basic Lion product. Aqua Ammonia, now being used in certain areas for direct application, is also available.

LION Nitrogen Fertilizer Solutions

Made specifically for the manufacturing of mixed goods. This product supplies both ammonia nitrogen and nitrate nitrogen in desirable ratios. Easily handled, and available in three types, designed for varying weather conditions and formula requirements, for the production of fertilizers that cure rapidly, store well and drill efficiently.

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In great demand because of its low unit cost (33.5% guaranteed minimum nitrogen) and superior qualities. The improved spherical white pellets are freer flowing and have increased resistance to caking, with better storing qualities.

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Use of this material enables the manufacturer to produce the high-analysis mixed fertilizers which are increasingly in demand by farmers. In the form of large white crystals which flow freely and resist caking in storage. Shipped in bulk and in 100-pound bags.

Technical advice and assistance to fertilizer manufacturers in solving their manufacturing problems is available for the asking. Just write:

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Inc., Baton Rouge, La.; Tilden Easley, American Cyanamid Co., Little Rock, Ark.; A. O. Leonard, Mississippi Agricultural Experiment Station, State College, Miss.; W. L. Tanner, Reade Mfg. Co., Panasoffkee, Fla.; and W. B. Albert, Clemson College, Clemson, S. C. Also on the program were A. J. Loustalot, Federal Experiment Station, Mayaguez, Puerto Rico; Lawrence Southwick, Dow Chemical Company, Midland, Mich.

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NFA Grazing Tour Held

A winter grazing tour, sponsored by the pasture subcommittee of the National Fertilizer Association's plant food research committee, was to take place on February 7 and 8 in cooperation with Mississippi State College. The tour, scheduled to begin at Starkville, Miss., on Feb. 7, was to continue to Jackson that evening and terminate in Biloxi, Miss. on the next night. Members of the tour were then to be present for the meeting of the Association of Southern Agricultural Workers and the Southern Weed Conference at the Buena Vista Hotel in Biloxi.

The subcommittee in charge of the tour was composed of J. A. Naftel, chairman; P. J. Bergeaux, B. S. Chronister, A. L. Grizzard and J. Fielding Reed.

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Purdue Conference Held

The 14th annual conference of Pest Control Operators was to be held during the week of February 6 at Purdue University, Lafayette, Ind. Subjects on the first day were to include studies of insect control, identification of insects, and a demonstration of insecticide applicators.

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Dickinson Joins U.S.I.

Dr. Berton C. Dickinson has been appointed to assist in the management of entomological work in the Baltimore Research and Development Laboratories of U. S. Industrial Chemicals, Inc. Dr. Dickinson, a graduate of Connecticut State College and Ohio State University, was formerly connected with Sherwin Williams Company.

Bryant Phillips Tampa Mgr.

J. H. Bryant has just been named as manager of the Tampa, Fla.

J. H. BRYANT

district of the fertilizer sales division of Phillips Chemical Co. Mr. Bryant, a 1936 graduate of Mississippi State College, was connected for a time with the Barrett Division of Allied Chemical & Dye Corp. More recently he has been southeastern sales representative for the chemical department of Quaker Oats Co.

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APFC Grange Offer Prizes

A nation-wide essay contest on "Soil Fertility and the Nation's Future" with $10,000 in prizes has been announced by the National Grange and the American Plant Food Council. The contest, which was to begin on February 1, extending through April 15, is open to young men and women through 20 years of age.

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Texas Ento. Meeting

The Texas Entomological Society held its twentieth annual meeting at the Rice Hotel, Houston, January 19 and 20. Dr. H. G. Johnston, vice-president of the Texas A & M College Department of Entomology, was elected president of the group, to succeed Cameron Siddall, Pennsylvania Salt Mfg. Co., Bryan, Texas. The new vice-president is Dr. D. E. Howell, succeeding Dr. Johnston. Sherman W. Clark, Texas Gulf Sulphur Co., Houston, was named secretary-treasurer, to succeed L. F. Curl, U.S.D.A., San Antonio.

Development of new insecticides was discussed by representatives of several groups. C. O. Eddy, director of research, Niagara Chemical Division spoke as a manufacturer; Dr. Johnson talked from the viewpoint of a research entomologist; D. S. Earley, Port Fertilizer & Chemical Co. discussed the topic as a blender; and A. C. Gunter, Texas A & M, from the standpoint of the extension entomologist.

Control of insect pests on cotton was a thoroughly discussed subject at the meeting, with discussions covering this topic appearing nearly every session. Control of livestock pests was also prominent on the program. The annual banquet was held on January 19.

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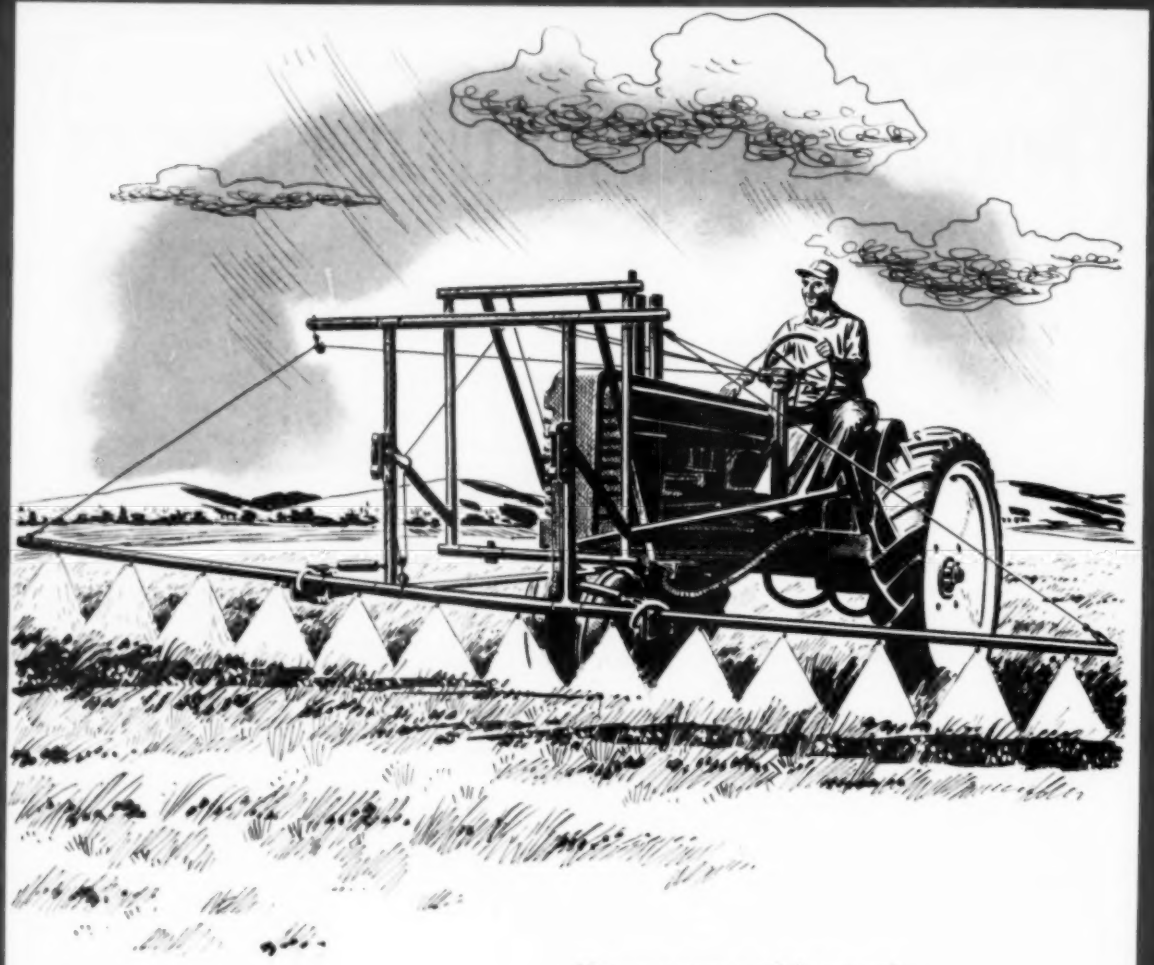
N. Central AAEE to Meet

THE North Central Branch of the American Association of Economic Entmologists will meet in the Hotel President, Kansas City, March 23 and 24. The general plan for the meeting is to emphasize "discussions" rather than prepared papers. Discussion leaders have been named to lead off the programs for the various panels. The banquet will be held the evening of March 23, with Dean Floyd Andre of Iowa State College as speaker. The program will consist of sections on residues, control of flies, corn pests, insects affecting fruit, and cereal and forage crops.

Chairman of the program committee is Roscoe E. Hill, Nebraska. Other members of the committee include Glen E. Lehker, Indiana and Donald A. Wilbur, Kansas. The tentative program named the following men as chairman of various sessions of the meeting: Ephriam Hixson; T. E. Bronson; J. A. Monroe; George List; B. A. Porter and C. R. Neiswander. Topics will include "Insecticides, Residues and Equipment"; "Insects Affecting Man and Animals"; "Truck Crop Insects"; and a special session on Agriculture.

TOMORROW'S BUSINESS....



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FUNGICIDES

(*Continued from Page 31*)

Disease of Lima Beans

A FEW reports were received on the incidence of downy mildew of lima bean (*Phytophthora phaseoli* Thaxt.). Areas of infection included southern New Jersey, south-central and southeast Pennsylvania, Long Island, New York, and Sussex and Kent Counties in Delaware. Source of inoculum is unknown. Infection was local in Pennsylvania and New York, and local to general in Delaware and New Jersey. Estimated percentage of infection in fields ranged from 5 through 55, with as high as 80 percent infection noted on pods on individual plants in localized areas of some fields. Weather conditions at time of infection and spread were indicated as moderate rainfall with temperatures above normal. Serious losses were reported in New Jersey; reduction in yield in other areas was estimated at none to 40 percent. Copper sprays, either Bordeaux or fixed coppers, and copper dust were used. No control results were given.

TABLE II — CONTROL OF LATE BLIGHT ON POTATO: Materials used as dusts and their effectiveness in 1949.

Fungicide or Material	State area or Prov. N.E.	S.	W.W. Pr.	Formula or Dosage	% using	% applied by Ground	Mach.	Airpl.	Results and Remarks
"Basicop"			1	?		100			Good
"Copper A."			1	?	2	100			Good
"COC-S"			1	?					
"COC-S		1	1		1	100			Fairly good
				6% Met. Cu.	99	10			Good
Copper-lime dust		1		20% Cu-80% lime	5	100			Fair
Fixed Copper	2	1		7%	48	all			Good to poor
				7%	5	70	30		Fair
				6%	10		none		Good
Misc. Copper dusts		1			2	100			Good
Neutral Copper	2				99	100			Good
				7%	5	all			Good
Tribasic Copper Sulphate	1	1	1	7% Met. Cu. in all cases	90	10			Good
					75	90	10		Good
					20	100			Good
"Yellow Copper oxide"		1		6% Met. Cu.	5	100			Poor
"Dithane Z-78"		2		3.9% active ingredient(1)	10	100			Poor to good
				Mfg.(1)	5				Good
"Dithane"			1	6%	90	10			Good
"Parzate Z-78"	1			10%	1	all			Good
"Parzate"			1	6-8%	90	10			Good-excellent
CONTROL OF LATE BLIGHT ON TOMATO: (dust materials—continued)									
Copper	2			7%	4	2	2		Fairly good
				6%	40	all			Good
Copper A		1		12%	?				Clear-cut results obscured because of dry spell three-fourths of May
Fixed Copper	1	1	1	20-80	25			100	Good
				5-7	5	all			Good
				6% Cu.	5	all			Poor
Copper Lime	1			20% Cu-80% Lime	5	100			Poor
Tribasic Copper Sulphate	1			7% Met. Cu.	20	100			Good
"Yellow Copper Oxide"	1			4.8%	10	100			Poor
"Dithane Z-78" (commercial dust containing "Dithane")		1		6%	?				Clear-cut results obscured by dry spell during three-fourths of May
"Parzate Z-78"	1			10%	50	all			Good
Zinc Carbamate	1			10%	5	all			Good
CONTROL OF CUCURBIT DOWNY MILDEW: (dust materials—continued)									
Fixed Copper	1			7%	5	5			(no results given)
Copper dusts		2		7% Met. Cu.	35	100			Good
				5%	5			none	Fair results if used properly. Very little increase in yield
"Tribasic"	1			5% Cu.	60	10	90		Good
Organic dusts ("Fermate" and "Dithane Z-78")		1		6-10%	15	100			Good. In certain fields anthracnose caused very severe damage where these materials gave poor control
"Dithane Z-78"	1	1		one) 4-6% (water	25-40 of			over	
				state) melons)	Average			50	Good
				4% (cantaloupes)	less than 2	total			Poor
				6%	10	10	90		Good
"Zerlate"	1			10%	10	20	80		Good
CONTROL OF TOBACCO BLUE MOLD: (dust materials—continued)									
"Dithane Z-78"		1		±6½% active	Experimental				Excellent
"Fermate"	3	4		15% (1)	very little	all			Good
					10	hand dusters			Poor-exced.
					75				Good
					10-15				Good
					few				Good
					15	100			Results almost the same as for Fermate spray (see above) except, perhaps, a little less effective
					10			none	Good
"Ferbam"		1		15%	1				Good
"Parzate"		1		±6½% active	Experimental				Excellent

Conclusions

ALTHOUGH it is impossible to measure accurately the disease potential from year to year, it would appear from the reports this year that the coordinated efforts on the part of warning service participants are paying good dividends in disease control. Indications are that control measures were practiced more effectively this year, particularly for tomato late blight and cucurbit downy mildew. The use of blue mold control still appears to be governed by the gambling chance that the attack will be light, will come at a time inopportune for fungus growth, or will not appear at all. Tables 1 and 2 summarize all control information received this year.

•

New Service by Co-op

To promote more efficient use of lime and fertilizer, Eastern States Farmers Exchange, Inc., has developed a soil testing service centered at the West Springfield, Mass., headquarters of this cooperative. From test findings it has been demonstrated that on two-thirds of the soils tested, other than those planted to potatoes and tobacco, members of the co-op are not applying enough lime to make the most effective use of fertilizer. This is especially true when phosphorus and nitrogen are involved, according to E. K. Walrath, technician at the testing laboratory.

Through the new service, he says, farmers are finding that calcium and magnesium are important as plant nutrients in addition to their function in correcting acidity.

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Carbonic Gas . . . Sodium Chlorite Products . . . Sodium Methylate . . . Sulphuric Acid

FTC CHARGES

(*Continued from Page 37*)

a product with which the user is thoroughly familiar, and which he, at least up to this point, still apparently prefers."

The report deals at length with the alleged unwillingness of "large producers" to supply separate materials for consumers to mix their own fertilizers. "There has been complaint by farm groups, land grant colleges, and others, that the fertilizer industry does not supply enough separate materials in the open market to meet the needs of farmers and independent small mixers, including the cooperatives," it said. The report said such complaints are continuing, particularly among farm cooperatives, and particularly with regard to the phosphates.

Monopoly practices have raised the prices of fertilizer to the farmer and other users, according to the FTC report. Claiming that "collusive arrangements and cartel agreements" have helped build strong barriers against lower prices in the industry, the report described the "barriers" as follows:

1. Domination of the market by a small number of large companies.
2. Some of the largest fertilizer producers are also the largest mixers and are in a strong position to discriminate against independents.
3. Small mixers find themselves increasingly dependent upon their larger competitors for one or more of the principal fertilizer ingredients, nitrogen, phosphorous, or potassium.

"If, due to monopoly conditions, "the report continues," these materials are made available to farmers only at prices which, in relation to farm prices and farm income, prevent the farmer from replacing plant foods removed by crops, the mining of soil resources to the point of exhaustion must follow."

Speaking of the need for vastly increased consumption of fertilizer in the United States, the report said: "Although both production and consumption of fertilizers * * * expanded rapidly since 1939, the critical question still remains whether this increased utilization has been sufficient to meet the total need for fertilizer elements to maintain soil fertility.

"In 1947, the last year for which figures are available, consumption of commercial plant food was greater than in any previous year, but despite that fact, commercial plant food was consumed at only 68% of the estimated profitable use level. * * * the gap between the quantity of commercial plant food actually used and the quantity that might have been used profitably was widest in the West North Central and South Central Regions."

The principal specific suggestions embodied in the report are included in the following four general proposals, referred to earlier, for reducing fertilizer costs. These are:

1. **Locate producing plants closer to consuming areas where practical. This would eliminate transportation charges. Of course, the report noted, it would not be possible to relocate plants near materials found only in specific regions, or where the raw material lost considerable weight in processing.**
2. **By permitting the farmer to buy plant food as separate materials which he can mix or have mixed to his specifications. This would enable farmers to mix their own ingredients and save the cost of the filler and the cost of transporting the filler. "In the past," the report said, "farmers and independents have met formidible obstacles in trying to obtain separate materials instead of mixed fertilizers."**
3. **By holding the plant food in a given formula constant, eliminating the filler, and permitting the farmer to buy the resulting mix on a plant food rather than a tonnage basis.**
4. **By increasing the plant food content of a mixed fertilizer and permitting the farmer to buy the higher grade fertilizer on a plant food basis.**

"Greater freedom on the part of farmers and small commercial mixers to buy whatever grades of fertilizer materials that will serve their needs best at the least cost per unit of plant food requires more competition among material producers than has existed in the past," the report observes. It adds that additional production facilities for fertilizers, particularly high grade superphosphates, are "badly needed." This producing capacity should be "outside the direct control of the large fertilizer mixers," the FTC recommends.

TESTIMONY

(*Continued from Page 43*)

with an oil emulsion or lime sulphur as a delayed dormant spray, and TEPP and parathion are coming into use for aphid control.

The most important of scale insects attacking apple trees is the San Jose scale which spoils the fruit and can kill a tree. Effective control can be obtained with parathion.

Dr. Porter said he considers the codling moth and the pear psylla the two most important insects attacking pears. The pear psylla sucks sap from the leaves and other parts and devitalizes the tree to such an extent that an entire crop may be unmarketable. For early spraying an oil spray has been found effective but it will not give control during the entire season. Results secured with the use of toxaphene have been variable and parathion mixtures of derris or cube with oil have been effective.

Dr. Erval J. Newcomer, Senior Entomologist, Bureau of Entomology and Plant Quarantine, Yakima, Washington, was the first witness on January 18. Climatic conditions and extensive plantings in the Pacific Northwest favor insect growth. Ninety percent of the fruit from an unsprayed orchard may be wormy. Of the sixty major pests which attack orchards, at least ten must be controlled by chemicals that leave a residue. Dr. Newcomer estimated that the loss of fruit from insects is ten million dollars annually and that more than one half of the fruit loss in the Pacific Northwest is due to the codling moth.

When DDT was first used on the three species of orchard mites that cause serious damage in the Pacific Northwest, the mites increased and the damage was intensified. DDT also increased the growth of woolly apple aphid. Other methods of control, such as parasites, treated bands, baits, etc., have been effective only as

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supplements to the use of chemicals. Predators are effective but their numbers cannot be controlled. A dormant oil gives good mite control until July and lime sulfur and parathion are equally effective at early stage.

The use of mineral oil and lead arsenate to control codling moth became a common practice in the Northwest, but the residue problem arising from the use of lead arsenate was responsible for research into the use of other insecticides. It was found that barium fluosilicate, potassium fluosilicate and cryolite were about as effective as lead arsenate, and cryolite was recommended for use. Although other chemicals gave good control, each had certain disadvantages. DDT was effective in controlling the codling moth but increased the mite and aphid problem.

It was the standard practice twenty to thirty years ago in the Northwest to use mineral oil in controlling orchard mites, but in more recent years mineral oil became inadequate. "DMC," "DN-111," and parathion have been used more recently. In the case of woolly apple aphids, little or no residue has been found from the use of parathion if applied forty to fifty days before harvest.

Jack E. Fahey, in charge, Insecticide Investigations, Vincennes Indiana Station, of the B.E.P.Q. stated that climatic conditions in the central Mississippi Valley favor the growth of the codling moth with three generations a season being normal, and an occasional fourth generation being found. Insect infestation conditions in the central Mississippi Valley compare with those in the Pacific Northwest as far as apples are concerned and in addition there are disease control problems. In 1934, the only insecticide recommended for codling moth control was lead arsenate but investigations have indicated that nicotine-bentonite generally gives better control than lead arsenate, and DDT better control than nicotine-bentonite.

William H. White, in charge of the Division of Fruit Crop and Garden Insect Investigations, Bureau of Entomology and Plant Quarantine, was the first witness on insects affecting vegetables. He pointed out that crops are subject to attack by many kinds of insects some of which are general feeders while others attack only a specified crop. No one insecticide will control all of these pests and a grower must have a wide range of control chemicals from which to choose. He discussed the various types of damage caused by different insects to different fruits and vegetables, and the control obtained by the use of various types of devices. Mr. White stressed that insecticides are essential to the production of a crop that will yield reasonable return.

W. J. Reid, Jr., in charge of B.E.B.Q. Field Station, Charleston, South Carolina, stated that insects jeopardize the nation's supply of fresh, leafy vegetables and that the use of insecticides is necessary for satisfactory control. A survey made in the period 1935 to 1938 indicated that the damage from insects to cabbage was quite serious and that there was a need for more adequate control measures.

A study was also made of the limitations imposed by residues at harvest on the use of arsenical compounds on cabbage and it was concluded that it would be unsafe to apply arsenicals to cabbage after foliage, which will be a part of the marketed product, becomes exposed. In studies conducted from 1941 through 1949, DDT was found to be outstanding for control of insects affecting cabbage. He now recommends DDT for caterpillar control during pre-heading state of Cabbage growth, followed by use of rotenone, pyrethrum or combination of the two.

Roy E. Campbell of the Bureau of Entomology and Plant Quarantine Field Station at Alhambra, California, said that the cabbage worm was the most serious insect pest affecting cole crops in southern California. DDT has been found to be much more effective than other insecticides and is being generally used.

Horatio C. Mason, Bureau of Entomology and Plant Quarantine, Beltsville, Md., presented statistics to

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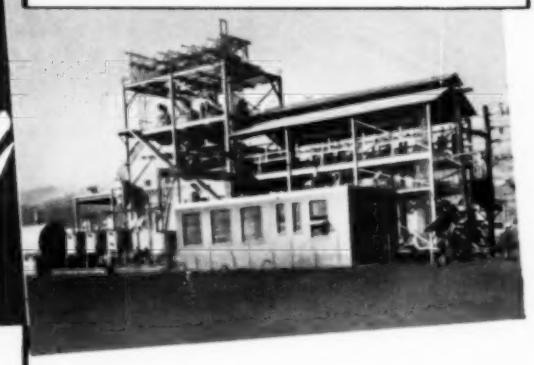

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See footnote for additional listing

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show the commercial importance of snap and lima beans and listed their important insect enemies. The Mexican bean beetle may be controlled by the use of cryolite although this material is not as effective as rotenone, he said. Recent work at Beltsville has shown that methoxyclor and parathion are quite effective. DDT has proved more effective than cryolite in controlling the corn ear worm which does considerable damage to snap and lima beans. There are no data, according to Mr. Mason, to show that washing removes DDT residue from beans.

T. E. Bronson, entomologist, Bureau of Entomology and Plant Quarantine, discussed damage done by the pea aphid, and its control with parathion, DDT, and rotenone.

Dr. Walter E. Fleming, entomologist, Division of Fruit Insect Investigations, Bureau of Entomology and Plant Quarantine, devoted a considerable amount of time to the Japanese beetle, which attacks approximately three hundred different plants. The beetle has been controlled to some extent by parasites, but due to rapid increase when it invades a new favorable environment, insecticides must be used to protect crops. In general, it has been found that sprays are more effective than dust.

Oliver I. Snapp, Field Leader, Fort Valley, Georgia, Station, Bureau of Entomology and Plant Quarantine, discussed insects attacking peaches. The plum curculio is the most serious insect which affects peaches. If it is not controlled, over half of the peaches are wormy or gnarled, he said. The San Jose scale kills the peach tree in many cases and frequently weakens the tree to such an extent that it becomes subject to attack by other insects. Lead arsenate for many years gave excellent control over the plum curculio, but has been only moderately successful in recent years. Parathion has been found to be the most promising insecticide for control of this insect. San Jose scale is controlled by dormant spray with parathion during the growing season.

George W. Still, Associate Entomologist, B.E.P.Q., covered damage to grapes by insects, and stated that control methods other than insecticides have not been effective. Lead arsenate has been the standard control for chewing insects on grapes for years, but the grape leaf hopper is not controlled by an arsenical. Nicotine sulphate and DDT give good control of the grape leaf hopper and the grape root worm.

Additional witnesses of the Department of Agriculture were expected to appear during the week of January 23 to 27, with the likelihood that they might continue into the following week in presenting more data on the necessity for use of insecticides and fungicides.

The Hearings were to adjourn until February 13, at which time state officials were to begin the presentation of their evidence. These presentations were expected to cover detailed information showing why growers in their particular states must use control chemicals in the commercial production of fruits and vegetables.

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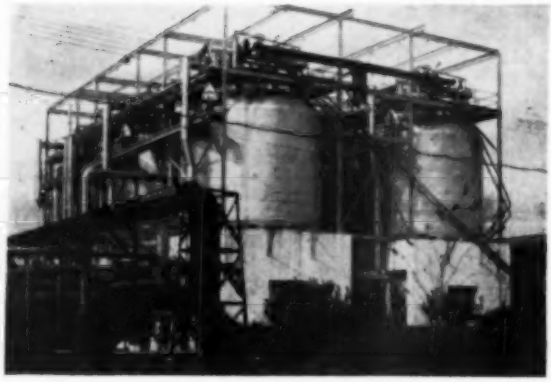

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Easy Lantern Slides

As a boon to scientists who face the problem of presenting legible lantern slides containing typewritten copy at various meetings, a simple method was recently explained by Dr. B. F. Driggers, Rutgers University, New Brunswick, N. J. It consists simply of inserting into a typewriter a specially-prepared carbon tissue envelope and typing the desired message directly. The results, according to Dr. Driggers and others who have utilized the process, are satisfactory.

The method is patented by the Radio-Mat Slide Co., Inc., New York, who market the carbon-tissue materials necessary for the process. After the matter has been typed, all that remains to be done is to drop the typed film and envelope between lantern slide cover glasses (3¼x4") and seal glasses together with strips of tape. The slide is then ready to be shown on the screen.

John P. Reed, also of Rutgers, states that in making graphs where lines are required, he first makes an actual-sized outline on a piece of onion-skin paper, then traces it onto the carbon with an ordinary stylus.

•

Kansas Weed Meeting

T. F. Yost, State Weed Supervisor, has announced that the annual Kansas State Weed Conference was to be held at Topeka on February 15 and 16.

HYACINTH CONTROL

(Continued from Page 49)

for the quantity of solution applied to an acre. For example, 8 lb. or 2 gal. of 40 per cent 2,4-D concentrate in 75 gal. of water applied to one acre of hyacinths constituted an effective treatment when the speed of travel was three miles per hour. In contrast, 200 gal. of a spray solution containing 8 lb. of 2,4-D were required with a Bean gun application to secure equivalent effects, and the speed of travel was limited to two miles per hour to insure coverage of all the plants.

2,4-D applied by helicopter. After investigating and testing methods of application from either truck-mounted or boat-mounted equipment, it was decided to investigate application from the air. Both the airplane and the helicopter offered possibilities. The helicopter with its greater maneuverability was decided upon because of the nature of most of the infested waterways. Preliminary tests with the helicopter indicated that it is perhaps the most effective and efficient means of applying sprays to the hyacinth-clogged waterways. Sprays applied from above the tree tops reached the foliage of hyacinths underneath, causing complete killing from bank to bank on canals lined with trees 50 to 75 ft. in height.

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Tree injury as evidenced by leaf and small branch kill occurred on some species such as willow (*Salix nigra* and *S. longifolia*), but no final evaluation of tree injury can be made until next spring when new growth occurs. One of the more important trees, the bald cypress (*Taxodium distichum*), was relatively resistant to 2,4-D, and though the foliage was killed, new leaves, normal in every respect, were put out within two months after treatment with 2,4-D.

Later tests designed to calibrate helicopter sprays indicated that the width of the spray pattern varied with the height as follows: at 10 to 20 ft. a width of from 50 to 60 ft. was effectively covered, with a higher dosage effect evident in the central 20 ft.; at heights of from 30 to 40 ft. the width was approximately 100 ft. of rather uniform coverage; and at heights of about 80 ft. the width covered uniformly and adequately averaged about 130 ft. (Table II). The delivery rate (gal. per acre) varied with the height of application. These results may vary when spraying tree-lined waterways.

Application of 40 per cent 2,4-D from the helicopter when traveling at a ground speed of approximately 30 miles per hour and fitted with 64 nozzle tips, each calibrated to deliver 0.2 g.p.m. at 40 lb. p.s.i. pressure, proved fully as effective as the 8 lb. per acre rate applied by means of boat-mounted equipment. It is believed that equally effective results could be obtained if the helicopter is flown at a speed of 40 miles per hour, provided the 82 nozzle tips are used on the standard boom. Results obtained with concentrations of 5 to 20 per cent 2,4-D have not yet been fully evaluated, but they will appear in a subsequent report.

In no case was there evidence that any of the 2,4-D sprays used were toxic to fish or other animals living in the treated waterways. Likewise cattle and wild life which grazed on the 2,4-D treated foliage apparently were unaffected. No residual effect of 2,4-D in the water in the treated areas has been observed.

Recommendations

THE following recommendations are based upon the use of commercial preparations of 40 per cent 2,4-D containing not less than 4 lb. of 2,4-D acid per gal. in the form of the alkanolamine or triethanolamine salt.

The following formulas have been devised to aid in preparing spray solutions and determining rates of application and delivery. The 0.1025 factor is based on 1 gal. of 2,4-D amine salt concentrate containing approximately 4.1 lb. of the free acid equivalent of 2,4-D.

1. If the concentration of the spray solution is 1 per cent (free acid equivalent) and the gallons of spray solution applied per acre (g.p.a.) is 50, determine the pounds per acre (p.p.a.) delivered:

p.p.a.=conen.×g.p.a.×0.1025

p.p.a.= 1.0 × 50 ×0.1025=5.125

2. If the pounds per acre to be applied is 8 and the gallons of spray solution delivered per acre is 50, determine the concentration (per cent free acid equivalent) of the spray solution:

$$\text{Conen. (\%)} = \frac{\text{Lb. per acre}}{\text{gal. per acre} \times 0.1025}$$

$$\text{Conen.} = \frac{8}{50 \times 0.1025} = 1.56\%$$

3. If a 10 g.p.m. capacity spray pump covers a 20-ft. width at three miles per hour (m.p.h.), determine the gallon per acre delivery rate:

g.p.a.=495×g.p.m.÷m.p.h.÷width

g.p.a.=495× 10 ÷ 3 ÷ 20=82.5

4. If a delivery rate of 100 gal. per acre is to be applied at a three mile per hour speed on a 20-ft. width, determine the capacity of the spray pump needed in gallons per minute:

$$\text{G.p.m.} = \frac{\text{Gal. per acre}}{(495 \div \text{m.p.h.}) \div \text{width}}$$

$$\text{G.p.m.} = \frac{100}{(495 \div 3) \div 20} = 12.12$$

Initial Applications to Areas Not Treated Before

FOR low volume, low pressure boom-type sprayers add 2 gal. of 40 per cent 2,4-D concentrate to the number of gallons delivered per acre. No spreader should be added. In the case of a nozzle calibrated to deliver 50 gal. per acre when the spray rig speed is three miles per hour, the 2 gal. of 40 per cent 2,4-D should be added to 50 gal. of water. Delivery rates and the speed of spray rig travel are furnished by the manufacturer for each nozzle, and these specifications should be followed carefully.

For high volume, high pressure gun-type sprayers use 1 gal. of 40 per cent 2,4-D concentrate per 40 to 50 gal. of water. Add an effective wetting agent according to manufacturer's recommendations (optional, but preferable). Apply spray solution so as to cover plants adequately at a speed not to exceed about two miles per hour, which means spraying at the rate of 150 to 200 gal. per acre. Direct spray only within the known effective killing range of the sprayer and adjust pressures to deliver the largest possible droplet size.

For airplane or helicopter applications the 40 per cent concentrate of the amine salt of 2,4-D should be used. No spreader should be added. Results with concentrations lower than 40 per cent have not yet been fully evaluated. Until it has been shown without question that concentrations lower than 40 per cent are effective, not less than 40 per cent should be used. A Bell 47-D type helicopter equipped with the standard Bell-type spray boom can be used. At a spraying speed of 40 miles per hour the spray boom should have 82

nozzles, each delivering 0.2 g.p.m. at a constant 40 p.s.i. pressure. Speeds other than 40 miles per hour will require a corresponding change in the type and number of nozzles used. This type of helicopter can treat approximately 500 acres per day. The width covered varied from 40 to about 130 ft. as the height varied from 10 to 80 ft. Margins of waterways lined with overhanging trees should be sprayed from a position above the trees. Rain falling 15 minutes after treatment will not cause a noticeable decrease in the effectiveness of the spray.

Apply sprays any time of the year. Most rapid and effective killing occurs during the period August through March. The recommended treatments which are effective for killing hyacinths will also give reasonably good control of alligator weed. Untreated areas should be isolated from treated areas by an arrangement of booms so as to prevent reinfestation by non-treated plants. If mechanical methods are used in conjunction with chemical treatments, the debris resulting from such operations should be treated in the initial spray application.

Maintenance Sprays

ANY type of spray equipment delivering from 5 to 100 or more gallons per acre may be used depending upon the relative number of plants to be treated. Spray solutions should be applied to cover adequately the scattered plants which generally drift to the shores or to the ends of waterways.

Concentrations of 2,4-D and methods of application for any given type of sprayer are the same as described under initial applications. When in doubt, use 1 gal. of 40 per cent 2,4-D to 50 gal. of water and wet plants thoroughly. An attempt should be made to kill every hyacinth plant. Timing of patrol maintenance sprays is less critical during the period August through March. Regardless of the time of year a patrol maintenance spray should be applied before any noticeable reinfestation has occured. Water hyacinth seedlings which seldom occur under natural conditions in effectively treated areas are readily killed by the treatments recommended for mature plants.

Precautions to Observe

AVOID spraying on windy days if crop plants or other sensitive plants are located near the treated areas. Sprays applied during the late fall and winter seasons are less likely to cause injury to crop, ornamental, or timber plants than when applied during the principal growing season. Experienced operators of spray equipment should be employed so as to obtain optimum results in killing hyacinths and at the same time cause minimum damage to nearby valuable plants.

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Opens Branch Office

International Paper Company's Bagpak Division will open a branch sales office in Denver, Colorado. Russell A. Gair is district sales manager.

So. Shade Tree Conf.

H. S. Newins, Gainesville, Fla., has announced that the 10th annual Southern Shade Tree Conference will be held March 23-25 at Wilmington, N. C. At press time the program had not been announced. Officers of the S.S.T.C., in addition to President Newins, are, E. T. Halter, Palm Beach, Florida, vice-president, and R. P. True, Morgantown, W. Virginia, secretary-treasurer.

NEW INSECTICIDES

(*Continued from Page 39*)

Field tests indicated that the material will control the following mites: red spider, European red, citrus red, Pacific, bryobia (Brown or clover) and willamette. It has been indicated that residual control of mites up to 4-6 weeks has been obtained with dosages ranging from one quarter to three quarters of a pound of 30% wettable EPN per hundred spray gallons. Insects for which EPN has shown promise are plum curculio, onion thrips, olive scale, oriental fruit fly, oriental fruit moth, codling moth and European corn borer. The material will probably be offered as a 30% wettable powder.

Preliminary toxicity tests indicated that EPN has a 4-8 fold toxicity advantage over parathion. EPN is much less volatile than parathion which serves to reduce the hazards of handling EPN still further. EPN has been established as an inactivator of the cholinesterase of the blood and tissues. Dupont has further stated that experiments have been begun to determine the physiological action of the chemical and to determine the value of atropine as an antidote.

Residue studies are still in progress but there are indications on apples that the residue decreases gradually over the immediate two week period after spraying from approximately 1.0 p.p.m. to 0.1 p.p.m. Residues with pears and peaches, from preliminary data, show 0.5—0.6 p.p.m. at harvest. Further residue studies are planned for 1950 on other crops as well.

Metaphos

The compound which had been previously named "Gearphos," will be marketed by a jointly owned company of Pittsburgh Coke & Chemical Corp. and Geary Chemical Corp. Previously, Geary had entered into a contract with Farbfabriken Bayer, Leverkusen, Germany, to manufacture and sell their developments in agricultural chemicals in the United States. The company has available several compounds which were developed by Dr. Gerhard Schrader who discovered what is now called parathion as well as a long series of other organic phosphate insecticides. More specific information about "Metaphos" and other compounds will be presented in a forthcoming issue.

Pestox #3 (Compound E-3314)

This compound which is chemically octamethyl pyrophosphoramide was first made available through the English firm, Pest Control Ltd. It is described as a selective

insecticide, that is, one which kills the pests but does not harm their natural enemies, and as a systemic insecticide which is defined as an "insecticide which is translocated in the plant and effective at some distance from the site of the "lodgement" of the insecticide."

The material has been available in the U. S. for the past year and has shown much promise in the control of mites and spiders. The compound was used commercially in England where it was shown that a good control of 14 aphis and 2 red spiders had been achieved by the use of this compound. In all cases, prolonged toxicity of from 2 to 5 weeks after spraying has been recorded. Promising results were also obtained in the prevention of aphis-transmitted virus diseases in the cases of beet yellow virus and of strawberry virus. Because of the absence of contact, insecticidally affected predators and parasites are not killed, and they are not harmed by feeding on aphids that have died from the poison.

Prolonged toxicology and pharmacology revealed "that the mammalian toxicity is similar to that of parathion but is slightly less." Work to date has indicated that "sprayed plots have shown that no toxic residue can be detected at harvest if crops have been sprayed up to six weeks beforehand."

A method for the determination of this compound in plant materials has been worked out.

In a subsequent issue, data on metaphos, aldrin, dieldrin, aramite and the nitroparaffin-based insecticides will be presented.

HEARING

(Continued from Page 23)

and inferior ones are substituted because they might be considered safer, the costs of production will increase materially, the consumer will be forced to pay more, and the standard of living in this country will be lowered.

"Federal entomologists, as well as those of State agricultural experiment stations, are concerned with the effective control of the insect hordes which in the absence of adequate control threaten the very existence of man on this earth. These entomologists continually keep before them the need for safeguarding the health of the public in their research and in their recommendations to the public for use of insecticides.

"Entomologists are anxious to have any hazards in the use of insecticides recognized, evaluated, and avoided. But they are also anxious to have recognized the tremendous advantages that have been gained and which can be more fully derived from the intelligent use of insecticides.

"The impact of insects on agriculture and the human economy is almost unbelievable. They have been the governing factor in shaping the history of nations. They are still playing a major role in pestilence and famine.

"The actual cost of insect depreciations cannot be measured accurately. Estimates of the losses caused

by various insect pests have been made and the figures, even on a conservative basis, are appalling.

"Four billion dollars annually is the most recent estimate of losses caused by insects, according to the Bureau of Entomology and Plant Quarantine.

"There are more than 80,000 different kinds of insect species in this country. Of these, no less than 6,000 cause damage. Grasshoppers cost farmers nearly 23 million dollars in 1946, a relatively poor hopper year. The corn earworm prohibits the profitable growing of sweet corn in many areas of this country. It also costs corn growers about 75 million dollars every year in reduction of field corn production. The European corn borer caused a loss which may reach 300 million bushels of corn in 1949. The hornfly reduces milk production by not less than 10 percent in severe hornfly seasons. The boll weevil takes as much as half a billion dollars worth of cotton in years favorable to this pest. And the list of the various taxes levied by insects on the people of this country seems endless.

"It must be pointed out that insect damage started in the field may not end at harvest. When insect pests are not controlled in the field, their feeding and resulting contamination of foods through excrement

and molted skins will frequently continue in market channels and ultimately into the housewife's pantry. Generous collections of plant lice and worms could be seen displayed on cabbage in store bins. Even now sweet corn is frequently well-eaten by worms that infest the tip ends of the ears. Insect damage to stored cereals in the United States is estimated to be at least 600 million dollars a year."

Dr. Bishopp's testimony pointed out that insecticides and fumigants are essential in meeting this serious problem. Those who produce fresh fruits, vegetables, and other foods thus find themselves in a serious dilemma. They must avoid insect losses and contamination on the one hand and pesticide residues on the other. Since insecticides are the main bulwark against insect depreciations, the establishment of reasonable, yet safe, tolerances of residues should aid in meeting the situation.

"Many kinds of insecticides are required to control the insect pests," Dr. Bishopp reminded. "This is because of the great diversity in structure and habits of the pests, the many different situations in which they are found and must be reached, the wide range of susceptibility of the numerous species to a chemical, the range of susceptibility of plants to insecticidal injury, the development of resistance of insect species to certain chemicals, and the variation in effectiveness of insecticides in different regions and under different climatic conditions.

"Some chemicals destroy one insect species and are harmless to another. DDT has little or no effect on many insect species, as lethal as it is to many others. It will kill the green peach aphid on potatoes in Maine, but not on green peppers in California.

"The development of strains of houseflies, and mosquitoes, resistant to the formerly highly effective DDT insecticides is now an established fact. Such occurrences have been observed before among a number of serious crop pests with other insecticides. It now appears that the problem of insects resistant to insecticidal chemicals is becoming more acute and widespread. Such resistance may develop rather rapidly. This is a serious situation which will necessitate research to develop suitable alternative insecticidal chemicals."

In emphasizing the importance of these Hearings, Dr. Bishopp expressed the opinion that the outcome will have a marked impact on every phase of American agriculture, and indirectly on the dietary standards and nutrition of all the people of the country.

LISTENING POST

(*from Page 61*)

consistently isolated from these diseased leaves and petioles.

All fields had been cropped to carrots previously, with the exception of one late 90-acre field which was planted to carrots for the first

time and was isolated four or five miles from any other crop. Blight was very prevalent in this field, showing up on young as well as older leaves. Considerable damage to the roots as well as the tops can be expected. The prevalence of the pathogen in this isolated field could not be accounted for.

It is believed that the appearance of the disease in epiphytotic form was due to the unusually high amount of rainfall and the high humidity during late July and early August. Most areas in the State have received more moisture than usual during summer months of 1949. The damage caused by the pathogen was checked temporarily by airplane dusting with a number of commercial copper fungicides.

N. E. WEED CONFERENCE

(*Continued from Page 41*)

these compounds are hormonal in action, the authors stated, and observed that the materials are especially effective against grasses. The fact that certain economic crops show resistance to the effects of these materials was indicative of their possible use as selective weed killers, it was stated.

The Weed Conference program committee was headed by Thomas R. Cox, American Cyanamid Co., New York. Other members of his committee included W. H. Lachman, Massachusetts State College; S. M. Raleigh, Pennsylvania State College; A. M. S. Pridham, Cornell University and A. H. Fletcher, New Jersey State Department of Health. In charge of the trade show, was Gilbert H. Ahlgren, Rutgers University, New Brunswick, N. J.

In connection with the Weed Control Conference, the 15th joint convention of the Empire State Potato Club and the New York State Vegetable Growers was held at the New Yorker. A luncheon was held on Thursday, presided over by C. Chester Du Mond, New York State Commissioner of Agriculture.

Mite Named for Pomerantz

Charles Pomerantz, president of the Bell Exterminating Co., New York, who won wide fame several years ago by discovering that rickettsial disease which had given N. Y. Health authorities much concern, is transmitted by a mite parasite of mice, has been honored by having a newly found mite named after him, according to Dr. Edward W. Baker of the U. S. Bureau of Entomology & Plant Quarantine. The newly discovered mite found in the routine examination of insects in Southern peach orchards has been named *Pomerantzia charlesi* by Dr. Baker. Dr. C. P. Alexander, dean of entomology at the University of Massachusetts stated that this is a unique honor in zoology to have an entire family, genus and species named after one man. Wide newspaper and radio publicity given to Mr. Pomerantz's discovery, in which Paul Muni, movie star, participated, was credited at that time with being of great value to the status of the pest control industry.

Reviews Lion Oil Record

T. M. Martin, president of Lion Oil Co., El Dorado, Ark., addressed a luncheon meeting of the New York Society of Security Analysts, January 16, giving a progress report on the operations of the company, with particular reference to the activities of its chemical division in the field of fertilizers and agricultural chemicals. Lion today produces over ten per cent of the U. S. output of synthetic nitrogen, Mr. Martin pointed out. Earnings in 1949, he estimated, will approximate $3.70 per share on the 2,349,813 shares outstanding at Dec. 31. This compares with $5.01 per share in 1948, the best year from an earnings standpoint the company ever had. The chemical division provided between forty and fifty per cent of the 1949 profits, he reported.

During the past year the company completed six major construction projects at a cost of seven million dollars, a large part of this total being spent to enlarge the company's facilities for production of anhydrous ammonia which have now reached a daily capacity of 570 tons. The company also built sulphuric acid and sulphate of ammonia plants with a capacity of 400 tons of sulphate of ammonia per day.

The company has reprinted Mr. Martin's talk. Bound with it is an appendix which includes tables showing: U. S. fertilizer consumption; U. S. nitrogen consumption; synthetic nitrogen productive capacity; annual nitrogen needs, etc.

New Pa. Fertilizer Plant

Eastern States Farm Exchange, Cambridge, Mass., is reported to be planning construction of a fertilizer plant at Kittanning, Pa. J. R. Myers, in charge of fertilizer production and purchasing for the Exchange, says the new plant will cost between $400,000 and $500,000 and have an annual productive capacity of between twenty and twenty-five thousand tons. D. O. Conrad will be in charge of the plant.

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V-C Chem. Workers Strike

Operations at the Charleston, S. C., plant of Virginia-Carolina Chemical Corp. were interrupted last month by a strike of about 250 employees. First demanding an increase of 25c an hour, their wage demand was later dropped to three cents an hour, then advanced once more to eight cents when the strike call followed the company's refusal to offer any advance. Strikers are members of the Mine, Mill and Smelter Workers Union (CIO).

FERTILIZER USE

(*Continued from Page 27*)

these two states 73,504 tons is consumed and but 26,641 tons in all of the other states. California and the states of the East North Central region consumed 53,617 tons of sewage products from the total of 78,350 tons for the United States. Michigan, Mississippi and Georgia are large users of ammonium sulfate, consuming 8,701 tons from the total of 12,975 tons. Bone meal is used generally in all states excepting those of the West North Central and Mountain regions.

The amount of plant nutrients supplied by fertilizers for non-farm use is shown in Table 4. The quantity of plant nutrients supplied by both mixtures and materials amounts to 17,286 tons of nitrogen, 21,462 tons of available P_2O_5 and 9,695 tons of K_2O, a total of 48,443 tons. This represents only 2.10 percent of all nitrogen, 1.17 percent of all P_2O_5 and 1.09 percent of K_2O supplied by fertilizers for all purposes. In southern New England and the Mountain and Pacific regions relatively larger proportions of the total plant nutrients are consumed for non-farm use than in the South Atlantic States.

The total number of packages sold for non-farm use is estimated to be 61.8 million. Approximately one per cent of the total tonnage is sold in 44.3 million packages of one ounce each. The largest tonnage is sold in 50 pound packages. The estimated number of the various sizes of packages is shown in Table 5.

TABLE 5

Estimated Number of Packages of Mixed Fertilizers Sold for Non-Farm Use, 1947-48

Package Size	Proportion of Mixed Fertilizer Tonnage	Number of Packages
Pounds	Percent	Millions
1 to 16	1	44.3
1	2	5.5
5	10	5.5
10	8	2.2
25	11	1.2
50	43	2.4
100	25	0.7
Total	100	61.8

Industry Patents

2,491,160. PRODUCTION OF DICHLORODIPHENYLTRICHLOROETHANE. Patent issued Dec. 13, 1949, to Everett A. Bruce, Paoli, Pa., and Charles W. Hagerman, New Castle, Ind., assignors to Pennsylvania Salt Mfg. Co., Philadelphia. The method of producing a friable solid product from a normally non-friable DDT material which comprises cooling said material within a period of not more than ten minutes from a temperature above its setting point to a temperature below about 60° C. and thereafter maintaining the material below about 60° C. until solidification is complete, the material being subjected to agitation at least during the initial stages of its solidification.

2,490,202. INSECTICIDAL COMPOSITION COMPRISING A POLYCHLORO BRANCHED-CHAIN HYDROCARBON. Patent issued Dec. 6, 1949, to George A. Buntin, Wilmington, Del., assignor to Hercules Powder Co., Wilmington. An insecticidal composition comprising a polychloro branched-chain hydrocarbon and a diluent, the polychloro compound containing from about 60% to about 80% of chlorine and being a chloro derivative of a branched-chain hydrocarbon in which at least one alkyl radical is attached to a straight chain of from 4 to 6 carbon atoms, the total number of carbon atoms in the molecule being equal to from 6 to 12.

2,490,437. DDT IN PETROLEUM SOLVENT STABILIZED WITH LANOLIN AND DIMERIZED EIGHTEEN CARBON ATOM FATTY ACIDS. Patent issued Dec. 6, 1949, to John C. Hillyer, Bartlesville, Okla., assignor to Phillips Petroleum Co. A solution of DDT and a petroleum solvent containing sufficient DDT to be supersaturated at —10°F. and also containing dissolved therein at least 0.5 weight per cent of dimerized mixed C_{18} fatty acids. A solution of DDT and a petroleum solvent containing sufficient DDT to be supersaturated at—10°F. and also containing dissolved therein at least 0.5 weight per cent of lanolin.

2,490,481. STABILIZED DDT SOLUTIONS. Patent issued Dec. 6, 1949, to W. A. Schulze and John C. Hillyer, Bartlesville, Okla., assignors to Phillips Petroleum Co. A solution of DDT in a petroleum solvent containing sufficient DDT to be supersaturated at—10°F. and also containing a gum selected from the group consisting of gum guaiac, gum benzoin and mixtures thereof in proportion in the range from 0.05 per cent by weight up to saturation of the solution with gum.

2,491,632. METHODS OF PRODUCING INSECTICIDAL COMPOSITIONS CONTAINING RELATIVELY SMALL QUANTITIES OF 2,2-BIS (P-CHLOROPHENYL)-1, 1, 1-TRICHLORETHANE. Patent issued December 20, to F. W. Weider, Berkeley, Calif., assignor to Stauffer Chemical Co., New York. A method of making an insecticidal composition comprising vaporizing 2,2 - bis(p-chlorophenyl)-1,1,1 - trichlorethane into a gas stream, grinding a mass of a carrier to finely divided form, passing said gas stream through said mass of finely divided carrier in a comminution zone while the carrier is undergoing grinding and comminution to subject the deposited 2,2-bis(p-chlorophenyl)-1,1,1-trichlorethane to grinding and comminution in said zone to deposit the 2,2-bis-(p-chlorophenyl)-1,1,1-trichlorenthane thereon in finely divided form before the carrier leaves the comminution zone, and separating the gas stream from the carrier.

2,491,468. LIME TREATED SABADILLA SEED INSECTICIDE. Patent issued December 20, to Thomas C. Allen, Madison, Wis., assignor to Wisconsin Alumni Research Foundation, Madison. An insecticide in which the active ingredients are powdered sabadilla seed and hydrated lime.

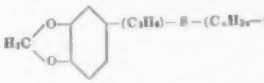
2,492,153. PREPARATION OF INSECTICIDAL POLYPHOSPHATE ESTERS. Patent issued Dec. 27, 1949, to David C. Hull and Jerry R. Snodgrass, Kingsport, Tenn., assignors to Eastman Kodak Co., Rochester, N. Y.

1. The method of preparing water-soluble polyphosphates containing 4 to 10 ethyloxy groups and 2 to 8 phosphorus atoms per molecule which comprises reacting not less than 2 mole parts of diethyl ether with 1 mole part of phosphorus pentoxide, said reaction being conducted under autogenic pressure at temperatures up to 180°C. for a suitable period of time between 8 and 24 hours to produce a reaction mixture containing a substantial amount of said polyphosphate in the presence of some diethyl ether and isolating insecticidal polyphosphate by distilling off at least a substantial part of the ether under pressure conditions not below 50 mm. and at distillation temperatures not substantially in excess of 110°C.

2,492,266. TETRAHYDRODICYCLOPENTADIENE ETHER COMPOUNDS AND INSECTICIDES THEREOF. Patent issued Dec. 27, 1949, to George A. Buntin, Wilmington, Del., assignor to Hercules Powder Co., Wilmington. A polychloro ether of hydroxytetrahydrodicyclopentadiene selected from the group consisting of polychloro alkoxy- and cycloalkoxytetrahydrodicyclopentadienes containing from about 50% to about 75% chlorine.

2,492,944. MEANS AND METHOD OF INTRODUCING LIQUID FERTILIZER INTO IRRIGATION STREAMS. Patent issued January 3, 1950, to Walter F. Aycock, El Centro, Calif., assignor to Tank Fertilizer, Inc., Brawley, Calif. A means for introducing liquid fertilizer into an irrigation stream comprising: a liquid fertilizer supply tank, means for supporting said tank beside an irrigation stream, a readily visible liquid level gage for said tank, a liquid level indicator associated with said gage, a discharge conduit terminating in a nozzle, a post positioned beside the irrigation stream, and means for supporting said nozzle at different elevations on said post corresponding to selected stations on said gage, said elevations being a constant distance below the liquid level of said tank, as evidenced by the indicator on said gage whereby as the liquid level in said tank is lowered the nozzle may be lowered correspondingly to maintain a substantially constant head.

2,493,927. METHYLENEDIOXPHENYL COMPOUND AS INSECTICIDE, INSECT REPELLENT, AND PYRETHRIN SYNERGIST. Patent issued Jan. 10, 1950, to Edward A. Prill, Yonkers, N. Y., assignor to Boyce Thompson Institute for Plant Research, Inc. An insecticidal composition comprising an organic compound repre-



sented by the formula where n is an integer 2 or 3, m is an integer not greater than 3, and R is an univalent radical of the group consisting of alkyl, aryl, alkaryl and aralkyl radicals, and nuclear mono substituted aryl, alkaryl and aralkyl radicals in which the nuclear substituent is a member of the group consisting of halogen and alkoxy; and in the above formula, the portion to the right of the sulfur atom contains not more than 16 carbon atoms and a petroleum distillate in which the compound is dissolved.

Trade Mark Applications

FAESY & BESTHOFF, INC., on scroll with outline letters "FB" in background, for fertilizers (rose food, peat moss, bone meal, tobacco dust and dried blood). Filed Mar. 27, 1948, by Faesy & Besthoff, Inc., New York. Claims use since Mar. 6, 1947.

PRIMA, in script letters, for specially prepared fertilizer. Filed Dec. 31, 1947, by Planters Cotton Oil & Fertilizer Co., Rocky Mount, N. C. Claims use since Mar. 1, 1930.

VERTAGREEN, in caps and lower case, for chemical fertilizer. Filed Dec. 13, 1948, by Armour & Co., Chicago, Ill. Claims use since Nov. 18, 1948.

GENITHION, in capital letters, for parasiticides, particularly insecticides. Filed Sept. 3, 1948, by Allied Chemical & Dye Corp., New York. Claims use since July 1, 1948.

PARACIDE, in capital letters, for insecticides. Filed May 4, 1948, by Hooker Electrochemical Co., Niagara Falls, N. Y. Claims use since Mar. 27, 1922.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 254 W. 31st St., New York 1. Closing date: 25th of preceding month.

Positions Wanted

Aggressive Sales Executive: 20 years productive marketing insecticide experience major agricultural areas. Seeks managerial position providing opportunity expansion your business this important market. Address Box 414 care of Agricultural Chemicals.

Entomologist: Graduate mid-western university, two years experience, young man, married, desires position in industry with chance for advancement. Excellent references. Eastern location preferred. For further details write to Box No. 415 care of Agricultural Chemicals.

Entomologist - Horticulturist: University graduate. Twelve years experience in research, development, and service of insecticides, fungicides, weedicides, and hormones seeks Pacific Coast position with reliable concern or fruit organization. Well acquainted with Pacific Coast fruit and truck crops, growing methods, pests, control methods, equipment and schedules. Address Box No. 416 care of Agricultural Chemicals.

Positions Open

Distributors & Salesmen Wanted: For fine imported North German peat moss, seedling pots and minature bales. Address Box No. 413 care of Agricultural Chemicals.

For Sale

Close Out Sale: Naco Root Dusters complete with motors and all accessories; 9 XB4's $159 ea; 3 ZA8's $309 ea; 1 ZA2, $315; 6 ZA1's $312 ea; also 4, YB4's complete except motor $149.50 ea; also several power take off packages and accessory packages, above all new, mostly packed in original crates. FOB Aurora Warehouse Inc., Aurora, Oregon.

For Sale: Controlling or minor interest in growing corporation Manufactures insecticides, paints and ag. chemicals. Several products deserving sales expansion with more capital. Potential deserves consideration of large company. Address Box No. 417 care of Agricultural Chemicals.

For Sale: Exterminating business on west coast. Fogging and spraying equipment consists of two electric Microsols, Tifa fog applicator, orchard mist sprayer and civilian Jeep. A going business for the price of the equipment. $5,000 cash. Address Box No. 418 care of Agriculture Chemicals.

For Sale: Tifa fog applicator. Cost over $2,000, used less than ten hours, will sell for $1,350. Address Box No. 419 care of Agricultural Chemicals.

Open Montgomery Plant

Agricultural Sulphur & Chemical Co., Dothan, Ala., manufacturers of "Protecto Brand" insecticides, fungicides and herbicides, announce the opening of a new modern plant in Montgomery, Alabama, which was expected to be in operation about Feb. 15. This plant is designed to handle technical materials, including sprays for cotton and other crops. In the future, the Dothan plant will be confined primarily to the production of sulphur and sulphur mixtures, while the Montgomery plant will be concerned essentially with the formulation and blending of insecticides for cotton, tomatoes, potatoes and other vegetables. In addition, they intend to put up a number of small package materials for the small gardener. George R. Williams is general manager of Agricultural Sulphur & Chemical Co.

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Union Bag Ups Woolsey

C. L. Woolsey, Multiwall Bag Sales representative for Union Bag & Paper Corporation in the South Central territory, has been appointed head of Marketing Research & Development for Union's Multiwall Department, it has been announced. A member of the Union sales organization for the past 10 years, Mr. Woolsey's new headquarters will be in the company's New York office. C. M. Campbell, formerly of the New York Multiwall sales office, will take over Mr. Woolsey's sales territory. He will be located in the company's Baltimore office.

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New Chlorinated Solvents

Wyandotte Chemicals Corp., Wyandotte, Mich., has just announced full-scale commercial production of five new chlorinated solvents which are said to show definite promise for various insecticidal uses. Designated as Solvent C96, Solvent C110, Solvent C160, Betachlor and Solvent R, these new products offer low cost as a particular point of recommendation for insecticidal use, in addition to their reported effectiveness against a wide range of common agricultural pests.

The vapors are toxic to sod webworms, plum curculio, cabbage maggots, wireworms, Japanese beetle larvae, white grubs, wooly aphids, pear thrips and peach-tree borers—making these solvents particularly useful for the effective control of insect infestation by fumigation. All are heavier than water, thus penetrate readily into the soil, and their low volatility assures the presence of effective vapors in the soil over long periods of time. Further investigation is expected to reveal these materials to be suitable for use in the industrial fumigation of grain and flour mills.

Smith Agr. Co. Elects . . . .

John E. Powell was re-elected president of the Smith Agricultural Co., Columbus, Ohio, at the annual meeting held January 13. The company manufactures commercial fertilizers, "Sacco" plant food, animal feeds and sulfuric acid. General offices are in Columbus, with branch plants in Indianapolis, Ind., Saginaw, Mich., Holland, Mich., and Carey, Ohio. An addition to the Saginaw plant which is nearing completion will double present capacity. Elmer C. Bansch was elected a vice-president and named district manager at Saginaw.

Other officers re-elected include Nelson T. White, first vice president and general sales manager; Howard F. Kimble, vice president and district manager at Holland, Mich.

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Int'l Ag. Congress in July

Plans are developing for the opening of the 8th International Congress for Agricultural Industries at Brussells, Belgium, on July 9, 1950. The meeting will continue seven days. The complete detailed program has not yet been announced, but the broad subjects to be discussed include studies on agronomy, fertilizers, insecticides, fungicides and other pesticides.

Those desiring further details, particularly regarding passage and hotel reservations abroad, should write Dr. T. C. Helvey, Department of Entomology, Cornell University, Ithaca, New York.

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Potomac APS Meets

Announcement has been made of the meeting on March 9 and 10, of the Potomac Division of the American Pytopathological Society at the auditorium of the Plant Industry Station at Beltsville, Md. Officers of the Potomac Division are C. L. Lefebvre, president; C. E. Cox, vice-president; J. B. Demaree, secretary-treasurer; and Paul R. Miller, councilor. All titles of papers to be given at the March meeting were to be in the hands of the secretary by February 15.

Advertisers' Index

(The Advertisers' Index has been carefully checked but no responsibility can be assumed for any omission.)

TALE ENDS

A GOOD natured feud between visiting Californians and their Florida hosts developed at the recent AAEE meeting at Tampa, as was expected. In a series of resolutions, the Floridians ribbed their western rivals as follows:

Whereas: AAEE president Al Boyce led such a fine delegation from the great territory of California into the State of Florida (all delegates from California were stopped at the Florida border where they were properly and thoroughly dipped to prevent possible introduction of ectoparasites of the human and clothing pests), the Florida Entomologists deem them worthy of special resolutions, and

Whereas: California is rapidly changing from a state of great sunshine and warmth to one of frigidity, therefore

BE IT RESOLVED, that the Congress be urged to realize the great natural deep-freeze potential of the territory and immediately endeavor to utilize it as a storage area for surplus quantities of perishable foods produced in Florida and other states, and

Whereas: the citrus fruits of California are becoming smaller each year, therefore,

BE IT RESOLVED, that the President be asked to urge the creation of a subsidy for this agricultural industry which will allow the purchase of sufficient quantities of plastic to permit the dipping of citrus fruits, thereby making California the greatest marble-producing center of the world, and

Whereas: The great state of California is rapidly becoming the mecca for winter sports enthusiasts, therefore

BE IT RESOLVED: that the name of this great state be changed immediately from California to Nuevo Alaska, and

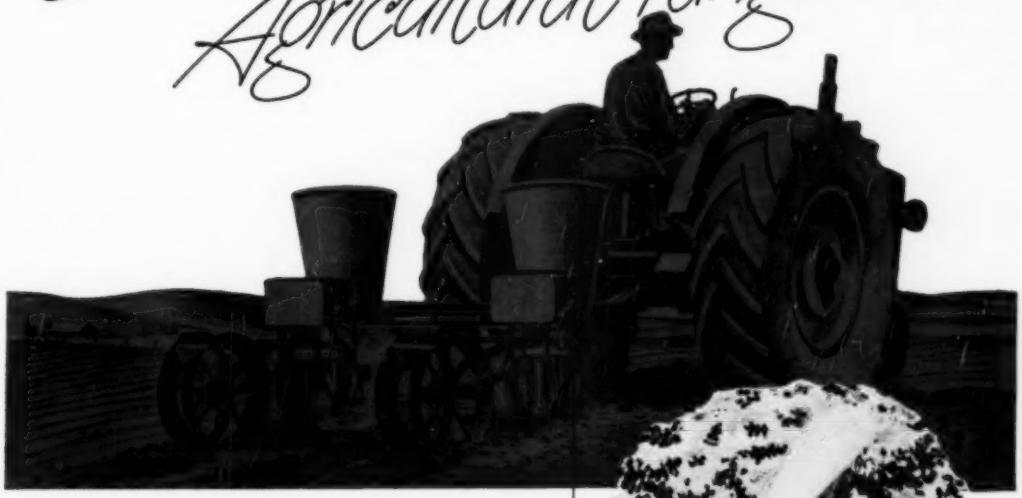
Whereas: Florida entomologists have enjoyed the visit of all the entomologists, therefore,

BE IT RESOLVED: that a special invitation be extended to one and all to make future trips to the great sunshine state of Florida which is first in the production of citrus, vegetables, livestock and hurricanes.

Not to be outdone, the California group presented the following resolution: Whereas the members of the A.A.E.E. from California have enjoyed the unsurpassed hospitality extended by Florida and enjoyed the fine weather, beautiful scenery, free orange juice, etc., therefore,

BE IT RESOLVED: that we unanimously agree that the invigorating climate of California, the spectacular scenery, the appetizing orange juice and star-studded football teams so far exceed anything seen or experienced in Florida, that comparisons are odorous.

2 Pittsburgh Agricultural Fungicides



Pittsburgh Spergon-sl*

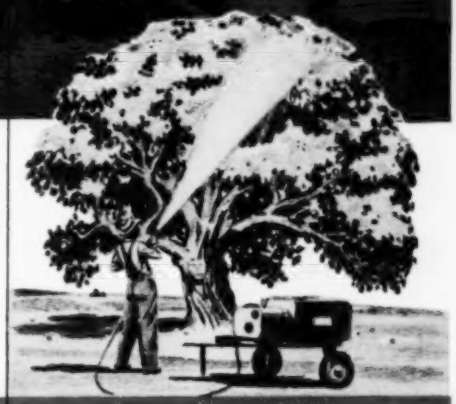
A safer, better seed protectant

Pittsburgh Spergon-sl is a non-metallic organic chemical fungicide . . . a highly effective protectant against the harmful fungi that cause seed decay and "damping off" of plants in the early post-emergence stage. Spergon-treatment of seeds, prior to planting, largely prevents seed and crop losses, as well as delays caused by necessity for reseeding.

Best of all, it is a really *safe* protectant to use . . . *safe* for humans, for animals, and for the seed itself. It is non-irritating to flesh or to the sensitive mucous membrane of the operator. And even an over-application of it cannot harm most valuable seed. More, this dry wettable powder can be used in either the slurry method or as a dry seed treatment and will not cause sticking or clogging in seed drills. It can be safely applied, too, with legume inoculation bacteria, if used according to directions. For corn, peas, beans, alfalfa and many other seeds, *Pittsburgh* Spergon-sl is the "perfect" protectant.

Write for a bulletin giving full technical information.

* Registered trade name for tetra-chloro-para-benzoquinone



Pittsburgh Phygon-xl* . . .

a new improved fungicidal spray

Pittsburgh Phygon-xl is a highly effective spray for the control of many of the fungous diseases of fruit trees, ornamental shrubs, and vegetables. It may be utilized, also, as a seed protectant.

It is easy to use, may be added directly to the water in the spray tank and is compatible with lead arsenate, DDT, Rotenone and Chlordane.

Ask for a bulletin giving full information about application.

* Registered trade name for 2, 3-dichloro-1, 4-naphthoquinone

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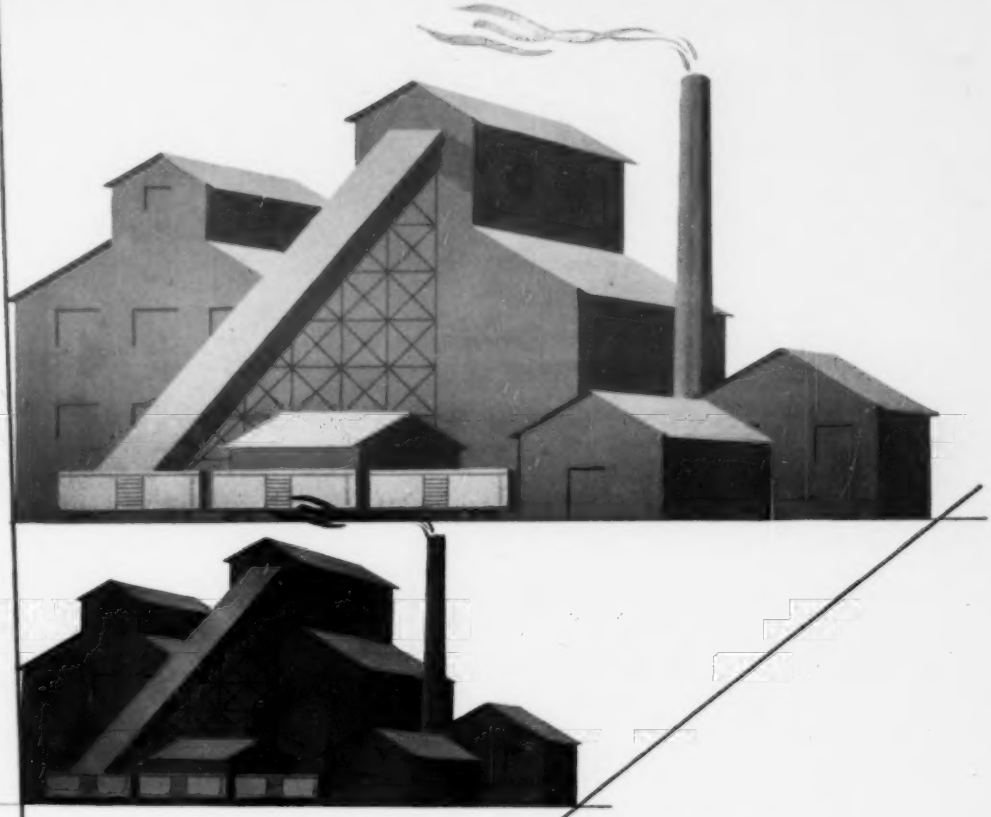
more toxaphene for 1950



To meet the continually increasing demand for toxaphene (chlorinated camphene 67–69% Cl), Hercules has greatly expanded its production facilities at Brunswick, Georgia.

We urge insecticide manufacturers to place their orders early, so that production and distribution may be scheduled to meet requirements as they arise throughout the season.

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